THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCII. No. 2222.] LONDON, DECEMBER 12, 1905. [57TH YEAR. PRICE 6d.

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— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS. **ORMSIDE STREET, LONDON, S.E.**

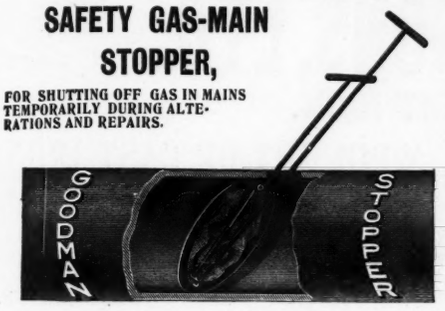
THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



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GAS-LEAK INDICATORS.

FOR GROUND USE. FLUSH BOXES ETC. HIGHLY SENSITIVE. LONG-RANGE.

FOR PURIFIER BLOW-OFF VALVES. FOR HARD USAGE.

WITH ALL LATEST IMPROVEMENTS.

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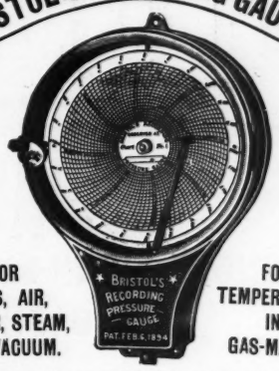

FOR GAS, AIR, WATER, STEAM, OR VACUUM.

FOR TEMPERATURE IN GAS-MAINS.

Many Thousands in Daily Operation.

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23, COLLEGE HILL,
LONDON, E.C.

All Pipes Marked

"S.A.V."

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VERTICALLY CAST IRON PIPES.

The only Foundry in Europe casting Pipes under Clarifying Process.

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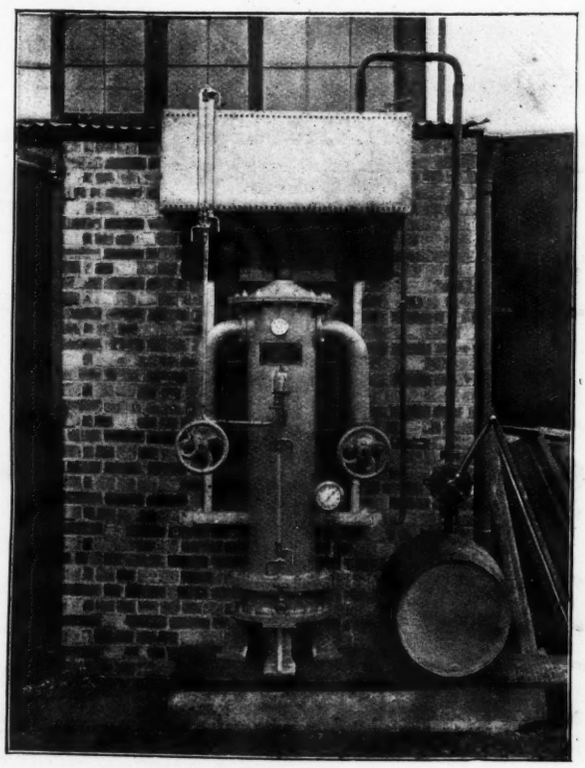
BIGGS, WALL, & CO.



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RELIABLE, PERMANENT, AND INSTANTANEOUS ENRICHMENT.

Dispenses with the use of Expensive Cannel.

SAVES WORRY.

INCREASES THE MAKE PER TON OF COAL AND COKE SALES.

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JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

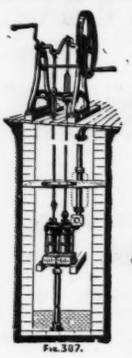
Fig. 387.

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Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7039.

TRADE MARK.

FIRST AWARDS EVERYWHERE.

Fig. 1A.

Fig. 34.

Fig. 46.

Fig. 185.

Fig. 550.

Fig. 222. Fig. 256.

Fig. 59.

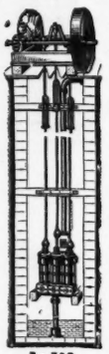
Fig. 328.

See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

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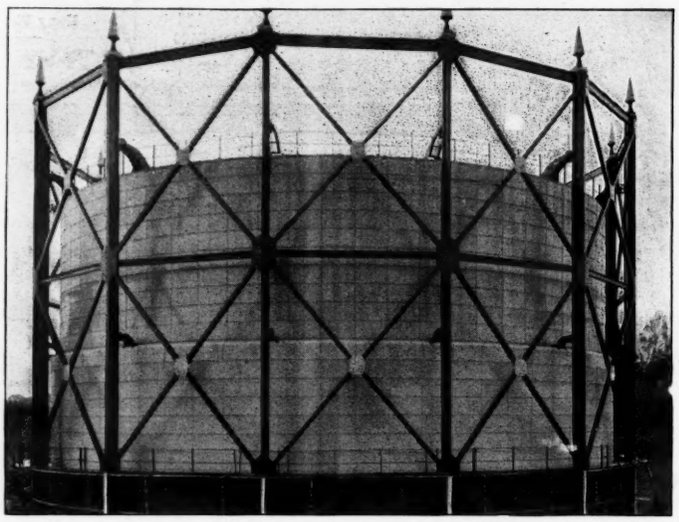
GASHOLDERS IN EITHER STEEL OR WROUGHT IRON.

GASHOLDER TANKS IN STEEL, WROUGHT OR CAST IRON.

CAST-IRON COLUMNS.

STEEL or WROUGHT IRON STANDARDS. *(Any Section.)*

INLET and OUTLET PIPES in either CAST or WROUGHT IRON, or STEEL.



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FOUL MAINS.
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HYDRAULIC LIFTS.
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BOILERS in either WROUGHT IRON or STEEL.

LAMP COLUMNS, MAIN PIPES, and IRREGULARS always in Stock.

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London Office: 181, QUEEN VICTORIA STREET, E.C. *BALE & HARDY, Agents.*

Every Description of

FIRE-CLAY GOODS

OF BEST QUALITY ONLY.

Personal attention given to all orders.

MOBBERLEY & PERRY, STOURBRIDGE.

INCLINED AND HORIZONTAL RETORTS of both Taper and Parallel Sections.

SPECIALS FOR WATER GAS PLANTS

CHECKER BRICKS ALWAYS IN STOCK

LARGE STOCKS KEPT.

THE BARROWFIELD IRON-WORKS, LTD.,

GAS ENGINEERS AND CONTRACTORS,

GLASGOW.

Telegrams:
"GASOMETER, GLASGOW."

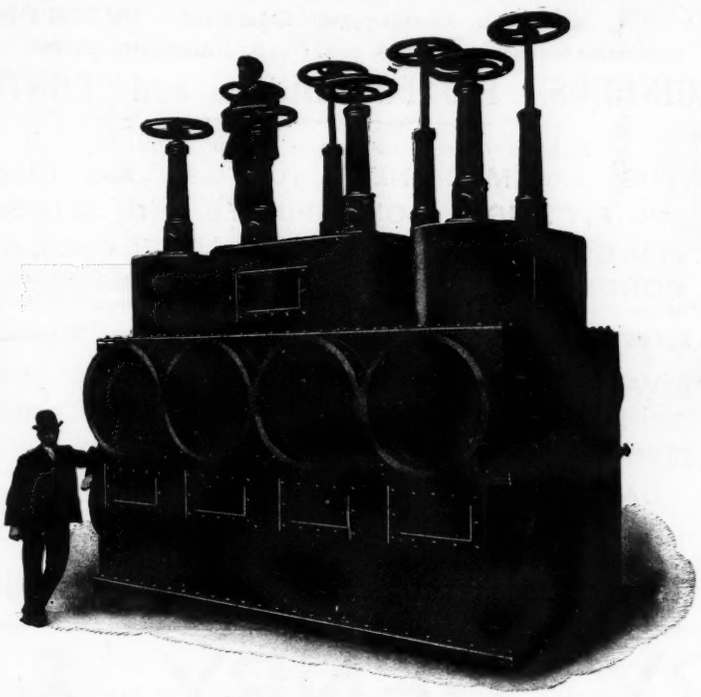
OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office:
6, LITTLE BUSH LANE, CANNON STREET, E.C.



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GAS APPARATUS OF EVERY DESCRIPTION.

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GASHOLDERS AND TANKS.

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Tel. Address: "ORME OLDHAM."
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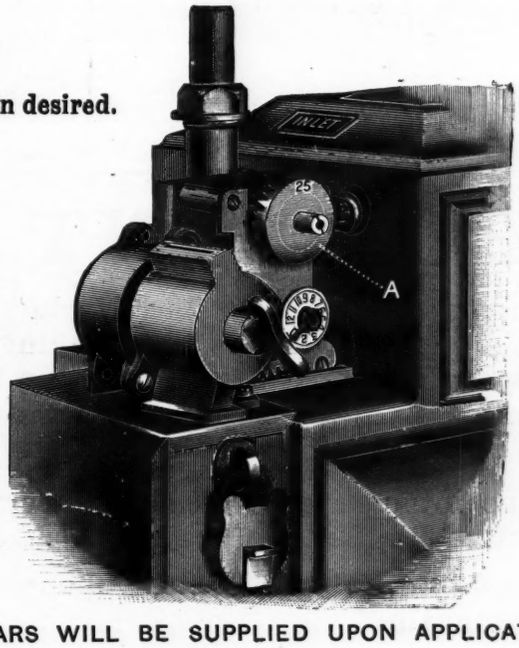
"NEW CENTURY" PATTERN

Patent Coin Prepayment Gas-Meters

Fitted with Detachable Attachments.

Arranged for 1d., 1s., or any other Coin desired.



Change of Price effected by simply removing Crown Wheel "A" and replacing same with another Wheel.

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THORNCLIFFE IRON-WORKS, near SHEFFIELD.

Established 1790

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MANUFACTURERS OF EVERY DESCRIPTION OF

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RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its Unrivalled excellence.

BARRY, HENRY, & CO.,

— LIMITED. —

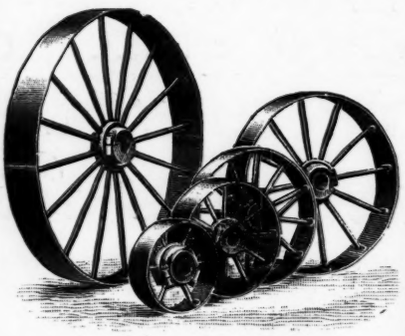
Specialities:

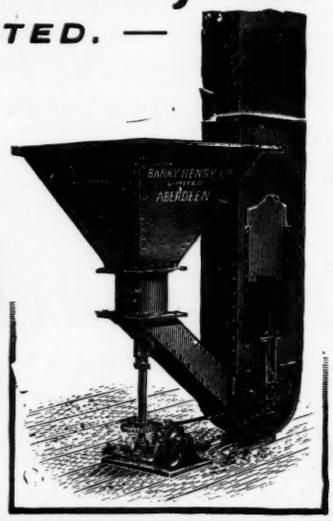
TRANSMISSION OF POWER.

Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals, & Fixings.

WORKS:

ABERDEEN,
SCOTLAND.





Specialities:

TRANSMISSION OF MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.

AND

64, MARK LANE,
LONDON, E.C.

IMPORTANT NOTICE.

It is the practice of the "Gas World" to publish from time to time analyses of the accounts of Gas Undertakings in this Country. A number of such analyses appeared in the issue for September 16, and they show that at Fenton, Longton, Rotherham, and Tipton, some of the highest results were obtained in Gas Made and Coke Sold.

It may be interesting to Gas Engineers to learn that at these four places Winstanley's Settings are in use.

The Winstanley Speciality Company, Newton Chambers, Cannon Street, Birmingham.

WELSBACH LIGHT

(PATENTED)

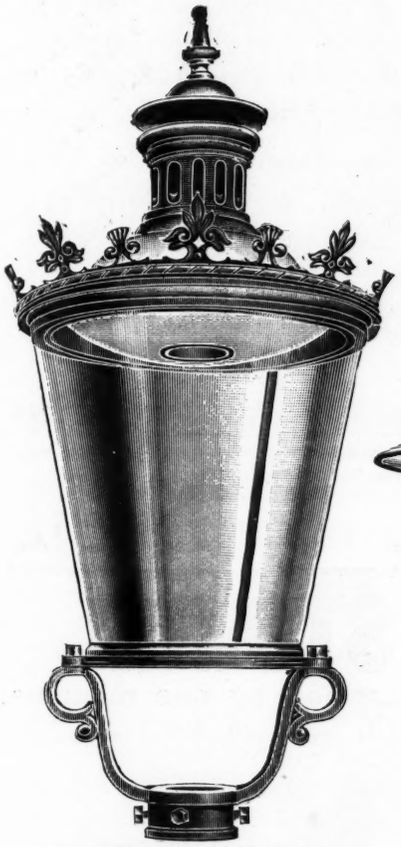


Fig. 35. 100 c.p.

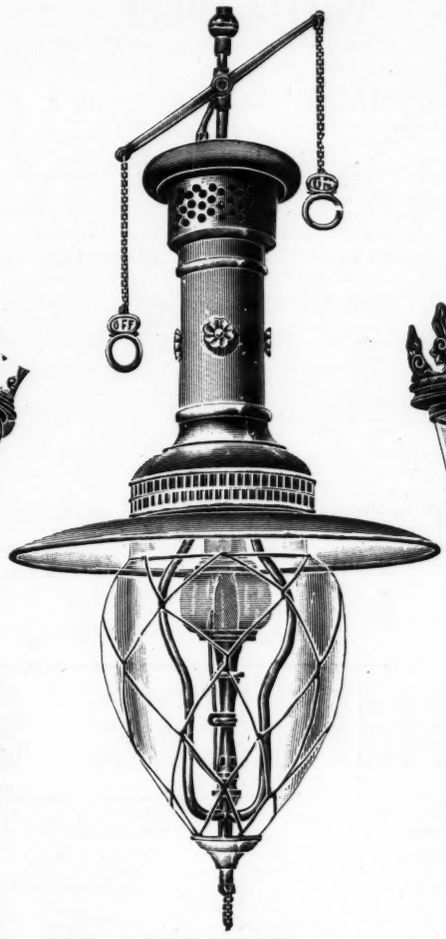


Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
Self-Intensifying.

WELSBACH "C," "CX," AND PLAISSETTY MANTLES,

4½d. each, subject.

Thousands of the above Lamps in use and giving satisfaction.

EACH LAMP AND MANTLE GUARANTEED.

THE

WELSBACH INCANDESCENT GASLIGHT CO.

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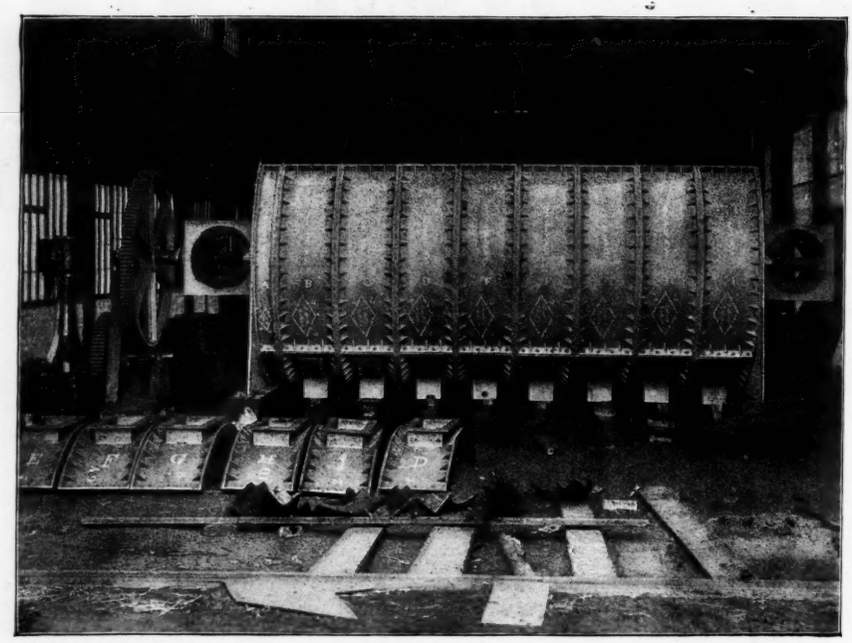
THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

LARGE AREA OF WASHING SURFACE.

REMOVAL OF THE WHOLE OF THE AMMONIA AND A LARGE PERCENTAGE OF CO_2 AND SH_2.



SLIP OF GAS IMPOSSIBLE OWING TO OUR PATENT TELESCOPIC SLIDING JOINT

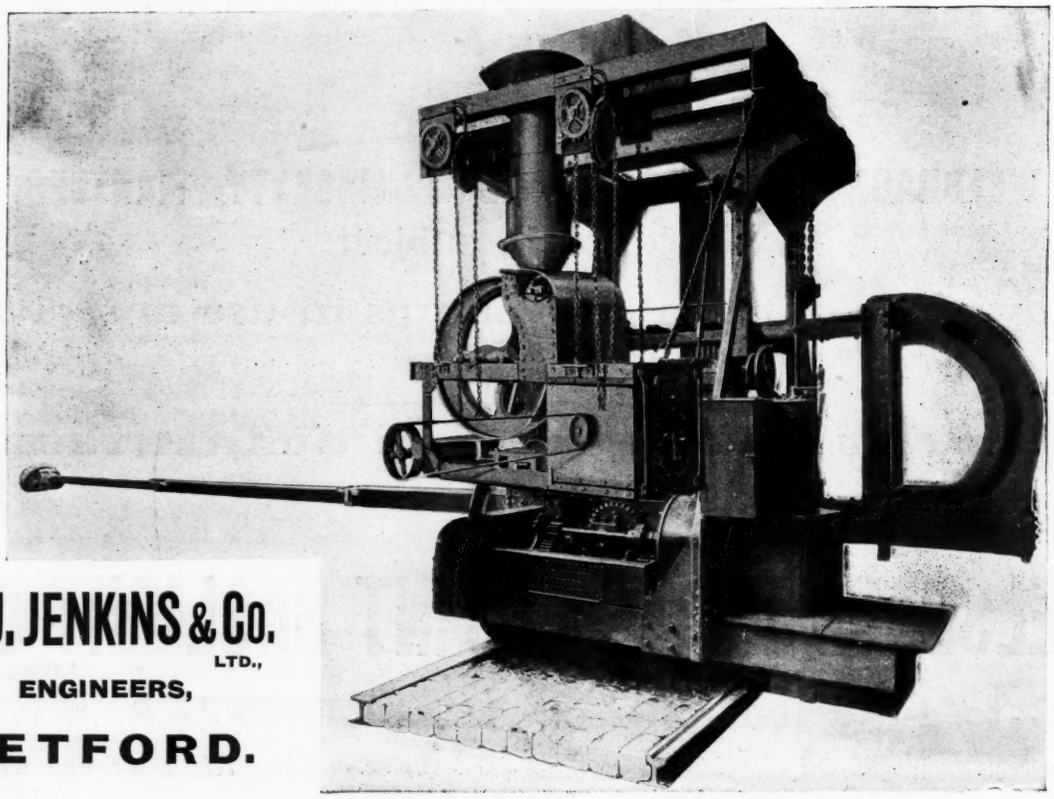
BUNDLES EASILY ACCESSIBLE FOR CLEANING.

"Whessoe" Rotary Washer-Scrubber (H. Kirkham & Chandler's patent). **Capacity 1,500,000 Cub. ft. per diem.**
One of Two Machines supplied by us to a Foreign Gas-Works, photographed in our shops during course of construction.

London Office: 106, CANNON STREET, E.C.

THE COMPLETE STOKER.

Both Discharging and Charging Operations performed by one machine, for Retorts 20 feet through.



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ENGINEERS,
RETFORD.

KING'S

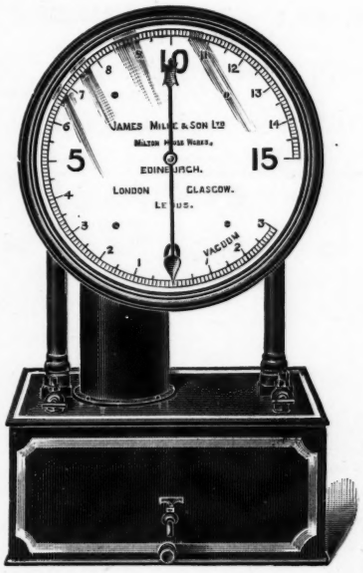
Pressure Gauge

IN

CAST IRON.

WITH LARGE DIALS

$11\frac{1}{2}$ & $16\frac{1}{2}$ inch diameter.



For CLEAN or FOUL GASES.

Any Range of Pressure or Exhaust.

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Milton House Works, EDINBURGH . . .

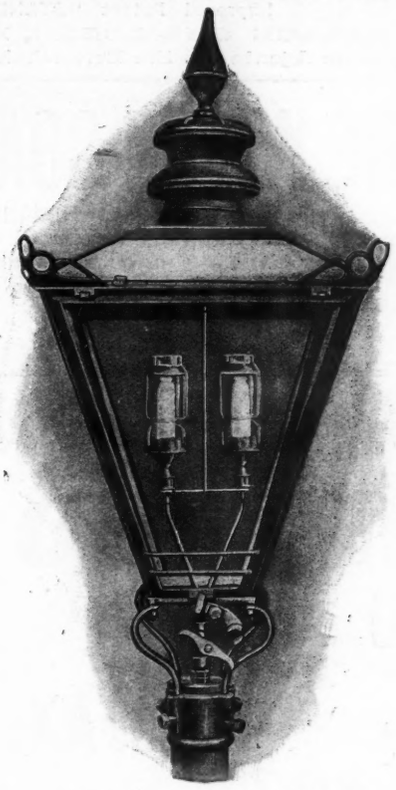
Also at LONDON, GLASGOW, and LEEDS.

BRAY'S "BAGBY" LANTERNS

For Incandescent Street Lighting.

ALL COPPER.

WIND AND RAIN PROOF.



BRAY'S No. 2 "BAGBY" LANTERN,
FITTED WITH
Enamelled Earthenware Reflector,
"Bray" Burners and
Anti-Vibrating Frame.

These Lanterns are in use in large numbers for Street Lighting in many of the principal Cities in the United Kingdom.

GEO. BRAY & CO., LTD.,

GAS LIGHTING ENGINEERS,

LEEDS.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

No connection with any persons of similar Names or any Firm making use of such names.

Improved Patent "STANDARD" Washer-Scrubber and Tar-Washer.

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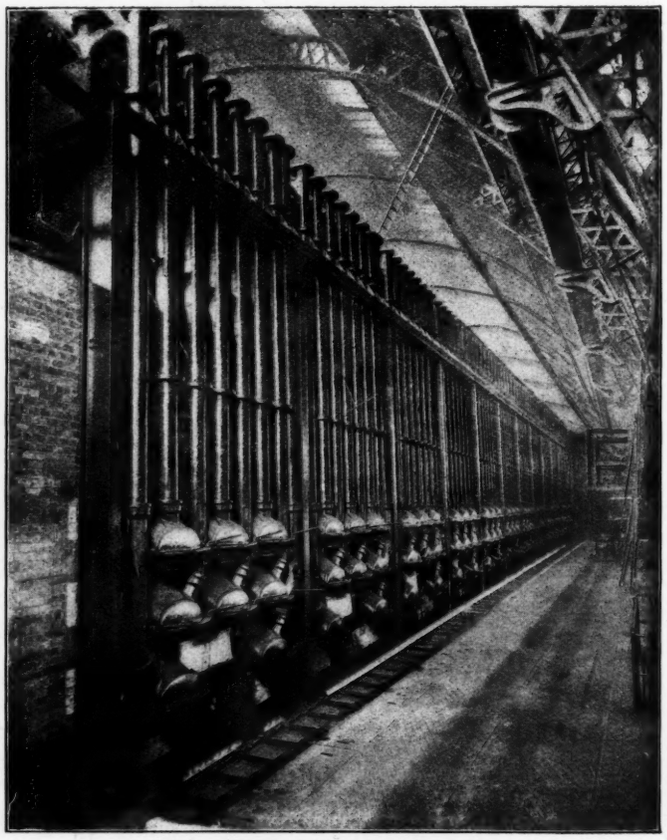
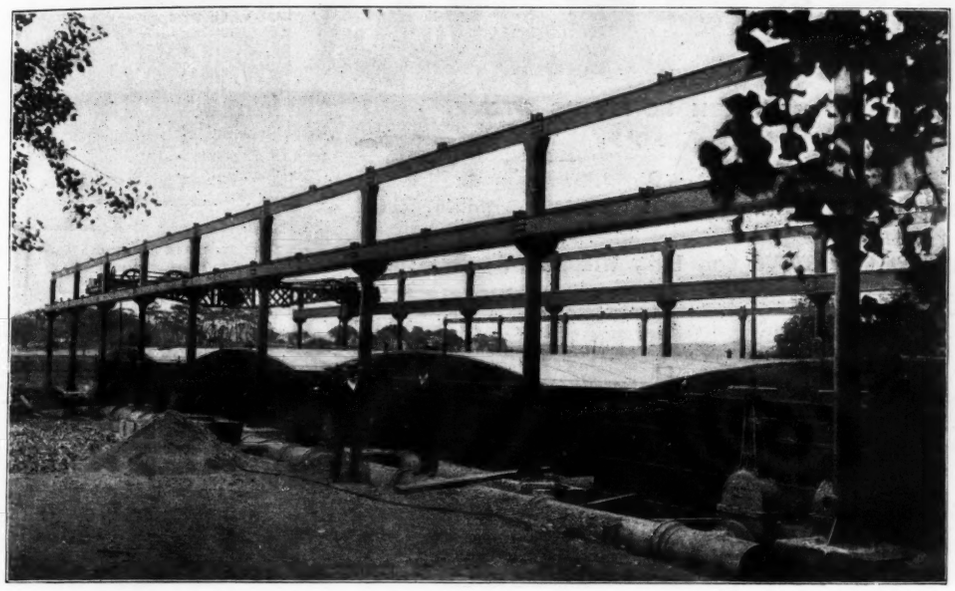
MELBOURNE:
31, QUEEN STREET.

Inclined Retort Installation, With Hot-Coke Conveying Plant.



ASHMORE, BENSON, PEASE, & CO., LTD.,
STOCKTON-ON-TEES,



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Four Purifiers, 30 ft. square, 20-inch Connections, also Columns and Superstructure for Roof.

Order placed March 30 } 21 DAYS INSIDE
Work finished July 18 } CONTRACT TIME.

(BOURNEMOUTH.)

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CLINKERING DOOR.

For Illustrated Advertisement, with full Particulars, see "JOURNAL" for April 4, p. 66.

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River Stour Works, STOURBRIDGE.
Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.
or of HARPER & MOORES, LTD.,
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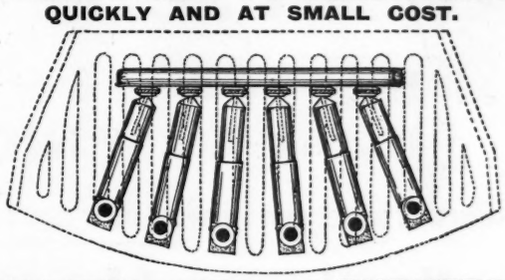
FIT GAS-FIRES TO COAL GRATES
QUICKLY AND AT SMALL COST.



TILLEY'S (PATENTED) BURNERS
Can be Adjusted to Shape of Grate and Gas Pressure *in situ*.

TILLEY BROS.,
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RED BAND
UNBREAKABLE
INCANDESCENT MANTLE

Made in England, by a secret process, from 3-ply Ramie and strengthened to prevent breakage, 100-Candle power.

OUTSHINES & OUTLASTS ALL OTHERS.

Sample Dozen, post free 3/6.

LAW, 11, New Market St., BLACKBURN.

EVERITT'S
PATENT TAR-EXTRACTOR
As a Naphthalene Remover.

The Exhaust Steam heats up the Tar and the Gas, and enables it to remove the maximum amount of Naphthalene. By removing the Tar, no Naphthalene is carried forward to the Scrubbers, except in strong and thorough combination with an **EXCESS** of light hydrocarbons, so evenly distributed and always sufficient in quantity to prevent the action of ammonia on the phenols liberating the Naphthalene dissolved by them.

SOLE MAKERS:
ROBERT DEMPSTER & SONS,
ROSE MOUNT IRON-WORKS, LTD.,
ELLAND, Yorks.

WINTER

YOUR CUSTOMERS WILL ASK FOR THIS STOVE,

THE "OMEGA," —

IT IS A HYGIENIC GAS HEATER OF GREAT POWER. GUARANTEED ODOURLESS AND WITHOUT FLUE.

Shall we send you list with your name on?

THE OMEGA ODOURLESS GAS STOVE Co., Ltd., WILDER ST., BRISTOL.

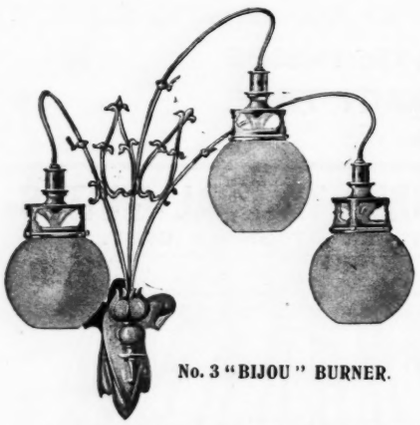
20

THE SYSTEM IS UNIQUE AND PROTECTED BY MASTER PATENTS.

THE

ORIGINAL NEW INVERTED BURNERS.

The "BIJOU" BURNER is the neatest, most decorative, and economical ever known, and is the real rival to Electric Light at One-Tenth the cost.



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All Mantles we supply are made of best double-woven Ramie, and marked with our Trade Mark,

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No. 2 BURNER.

INVERTED FITTINGS OF EVERY DESCRIPTION AND UP-TO-DATE DESIGNS.

The New Inverted Incandescent Gas Lamp Co., Ld.

23, FARRINGDON AVENUE, LONDON, E.C.

INSTALLATIONS AT THE GAS-WORKS OF—

West Bromwich, Ilford, Tipton, Bilston, Cleethorpes, Rushden and Higham Ferrers, Barking, Ilfracombe, Cape Town, Erfurt, Pfortsheim, Iserlohn, Barmen-Rittershausen, Mülheim a.d. Ruhr, Nürnberg, Plauen, Rome, Lyons, Gijon, Brummen, Osterfeld, Warstein, Wiborg.

HIGHEST EFFICIENCY.
GREATEST ECONOMY.

THE DELLWIK-FLEISCHER WATER GAS PROCESS.
PATENTS IN ALL COUNTRIES.
BLUE WATER GAS, CARBURETTED WATER GAS.

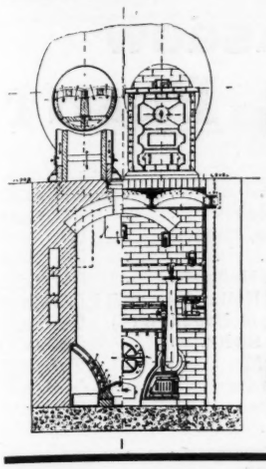
COMBINED WITH
SELF-CARBURETTING
AT

Imperial Continental Gas Association, Mariendorf-Berlin, Königsberg, Remscheid, Ludwigshafen, Güstrow, Salzwedel, Dortmund, Stuttgart, Hanau, Furth (Bavaria), Freiberg (Saxony), Osnabrück, Görlitz, Arnhem, Zutphen, Berne, St. Quentin, Barcelona, Beyrouth (Syria), Trieste.

THE

DELLWIK-FLEISCHER WATER GAS SYNDICATE

72, VICTORIA STREET, WESTMINSTER, LONDON, S.W.



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PATENT SYSTEM OF BOILER FIRING.

20 % Saving in Fuel.
20 % more Water Evaporated per hour.
Steady Steam Pressure.
Fuel Employed—Coal or Coke.

Perfect Combustion—17 to 18 % CO_2 in Waste Gases.
Producer Cleaned once in 24 to 48 hours.
Applicable to all Boilers.

INEXPENSIVE. DURABLE. SIMPLE.

DESIGNS AND ESTIMATES FROM

R. & G. HISLOP, 13, ST. JAMES PLACE, PAISLEY.

LONDON—87, VICTORIA STREET, S.W.

THE GAS-METER COMPANY, LD.

WORKS: 238, Kingsland Road, LONDON, N.E.;
Union Street, OLDHAM; Hanover Street, DUBLIN; 18, Atkinson Street, MANCHESTER.

AUTOMATIC METERS.

FOR ANY COIN.

Front View with Index Door Removed.

To change Price of Gas, remove Wheels marked T & B (Top & Bottom); replacing them with other Price Wheels sent free on application.

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GUARANTEED 5 YEARS.

WETS OR DRYS.

COAL TAR PRODUCTS.

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Antwerp, Belgium (2nd)	1,000,000	Flensburg, Sleswig	300,000	Bochum, Westphalia	530,000
Tottenham (5th)	1,000,000	Weston-super-Mare	300,000	Brussels-Anderlecht	350,000
The Hague, Holland (2nd)	500,000	Wexford, Ireland	100,000	Leigh, Lancs.	350,000
Hampton Court.	500,000	Budapest, Hungary	50,000	Stockport (3rd)	400,000
Lea Bridge (3rd)	400,000	Swindon.	300,000	Agram, Croatia.	200,000
Dublin (3rd).	650,000	Reading	1,000,000	Bruges, Belgium	200,000
North Middlesex (3rd)	75,000	Oberhausen, Germany	175,000	Liége, Belgium (2nd)	750,000
St. Gallen, Switz. (2nd)	225,000	Malmo, Sweden	350,000	Lemberg, Galicia	260,000
Brussels—St. Josse	1,000,000	Ipswich	750,000	Leeuwarden, Holland	400,000
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VOL. XCII., No. 2222.—TUESDAY, DECEMBER 12, 1905.

EDITORIAL NOTES—GAS, &c.

The Change of Government.

PARTY politics do not come within our journalistic ken, excepting in so far as party methods, and the likes and dislikes of political partisans, have influence upon the gas industry. For this reason, the political horizon has to be constantly scanned, and fresh appearances considered. Mr. Balfour's Government, as all the world knows, has resigned; and the Liberal party has taken in hand the reins of office—whether temporarily or otherwise is not known, as it is accepted as a certainty that the formation of the new Cabinet will be almost immediately succeeded by a General Election. A General Election early in the New Year is to be preferred to one later in the session, though, however soon it takes place now, it is possible that it will produce some little delay in the consideration of Private Bills. But it will have no other effect—such as would be the case if there was a dissolution of Parliament after the consideration of measures had been entered upon. With the sanction of the House, a Bill, though partly considered, may be carried from session to session in the same Parliament; but partly considered measures cannot, in similar manner, be continued from one Parliament to another. Therefore, as a General Election must come, the sooner we have it after Christmas the better.

Viewed to-day, it can be said that, during the long ascendency of the Conservative party in the management of our national affairs, the gas industry, from the legislative standpoint, has not had much to complain of, other than in regard to the inordinate amount of indulgence that has been granted to electricity supply, and particularly to that of the municipal order. As against the gas industry in all matters affecting electricity supply, the Board of Trade has presented an unpliant front until just lately, since which there has been evidence of a little yielding on their part, produced no doubt by the enlightening rays that, in the eventide of this Parliament, has penetrated the torpidity of the Government Departments in respect of the impetuous rate at which municipalities are running, through an apparently insatiable love for trading at the expense of the ratepayers, towards the abyss of financial disaster. If the General Election puts the controlling power into the hands of the Liberal party, there is nothing to show us that we, as an industry, will generally fare any worse than at present. It is, however, so obvious that we cannot be charged with political bias in referring to it, that those who are largely responsible for the swelling of the municipal debt and local expenditure are those of our local governors who flaunt the banner of Progressivism in pursuing their destructive policy, and they and their like are to be found within the Liberal ranks, under the style of Radicals. In these circumstances, should the appeal to the country result in continuing the Liberal party in power, then, on this particular matter of municipal freedom (which spells oppression for the ratepayer) there will be little or no hope of that reform for which the Gas Companies of the country among other of the considerable industries have of late been earnestly praying. Is any further comment needed when in the newly constituted Cabinet Mr. John Burns is the President of the Local Government Board, and Mr. Lloyd-George the head of the Board of Trade?

Birmingham and the Price for Power Gas.

IF a vote were taken of those responsible for the conduct of gas undertakings in the industrial regions of the country on the question of giving special consideration to manufacturers for their custom for gas for power purposes, we have every confidence that there would be a favourable result. Managements can be named who are vacillating over a decision, heedless of the fact that the agents of their competitors are making the best use of the opportunity thus allowed them of inculcating the economic advantages of every manufacturer being his own gas maker, or binding himself to the use of distributed producer gas when it is available. But if we have rightly read the lessons of what has been happening through the controversy of late in Birmingham, it has impressed us with the fact that, if a gas undertaking can supply manufacturers with its gas rich in thermal units at a price that works out, all things considered, to a proximate relative value, then they will prefer that supply. If not, then there must inevitably be what in all probability will be an irrevocable transference of custom; for no manufacturer can afford to work with dearer power than his competitors in business. The foundation of the prosperity of industrial towns and cities is, of course, the manufactures; and in the discussion over this question of cheap power, there has been a signal unmindfulness of this fact. Without elaborating the point here, every reader, whether identified with Company or Council, must clearly see for himself that heedlessness in this respect is not to the interest of a town or city, nor is it to the interests of those who are dependent upon the prosperity of the local industries, and who for the most part come within the category of the smaller consumers. Among the dependents too are the gas undertakings. Birmingham is a case in point; and every channel of activity in the great Midland city can have its source and subsistence traced to industry. The Corporation Gas Committee have recognized this; but it is only within the last few weeks that they have conceded to the manufacturers what they have now shown most conclusively it is to the interest of the Department and of the City generally to concede. To those who have carefully observed the course of events there, it has been quite transparent that the Committee have been trying to both save the industrial business and to preserve intact the goodly sum that is annually handed over in aid of the rates. But it was equally clear that they could not do both; and it was just as plain that, by going the right way to work to retain the former, the less was the probable injury that would be inflicted upon the latter. The dictates of wisdom and of reason now prevailed; and that the step they have just taken is in the best interests of the city, of the Department, of the ratepayers generally, and of the small consumers, is a fact protruded by the figures Sir Hallewell Rogers laid before the City Council last Tuesday, and which secured a large majority in favour of the Committee's recommendation.

It is only necessary to go back in the history of this matter to July last. Prior to then differential prices existed for power, varying between 2s. 6d. and 1s. 10d. per 1000 cubic feet. The suction-gas plant people had been busily sowing the seeds of dissatisfaction; and the manufacturers themselves had observed that surrounding gas undertakings were, within their respective areas, supplying the industrial establishments (with which the Birmingham manufacturers are in competition) with gas for power purposes at prices about the region of 1s. 6d. per 1000 cubic feet. The Gas Committee then determined, with the consent of the Council, to abandon differential prices for industrial use, and to level the price to all the manufacturers to the one which they had been charging the largest power consumers—viz., 1s. 10d. That this was a mistake is recognized by the almost unanimous vote, which was given on Tuesday (within four or five months of the former one) in favour of making the top price for small power consumptions up to 100,000 cubic feet per quarter 1s. 10d., and the bottom price for consumptions over the amount named 1s. 7d., less 5 per cent. for prompt payment. The levelling-down to 1s. 10d. gave no benefit to those concerns that were the largest patrons of the department, and whose custom was more likely to be lost than was that of the smaller consumer. A uniform price for power has a fair appearance on paper; and it is unquestionably the correct thing where there is not a great division between the largest and the smallest customer. But in a city like

Birmingham, where there is so vast a distinction between the highest and the lowest power consumptions, uniformity is a fetish that, with producer-gas and suction-gas plants available, must soon be (as it has been) overthrown. In justification for uniformity, the argument is advanced that suction-gas plant appeals just as much to the small power consumer as to the larger. There is a tinge of truth in this; but the small power consumer is not going to be worried much by the cost of installation of a suction-gas plant, the attention that it requires, and the uncertainty involved, when he can get gas within the neighbourhood of 600 B.T.U. at a cost of 1s. 10d. per 1000 cubic feet. Supposing he is a consumer of 90,000 cubic feet of gas per quarter, the difference between him and the largest consumer for power will only amount to about a sovereign in the three months. Like considerations, however, would not have the same weight with the large consumer of power, when he comes to total up the savings that the suction-gas plant can effect on a consumption of the magnitude of his own. However, for consumptions of over 100,000 cubic feet per quarter, the Corporation have endorsed the proposal of the Gas Committee to come down to 1s. 7d. per 1000 feet, less 5 per cent. for prompt payment. This is a figure at which the best authorities on the matter of the relative values of ordinary town's supply and that from suction-gas plant tell us the former can well compete with the latter. Therefore, if the manufacturers of Birmingham are wise, they will forthwith reject the overtures of the suction-gas people. On this point, it ought not to be overlooked that, through Mr. Hampton Barber, the manufacturers were invited to show that they could supply themselves with gas for motive power purposes and effect a saving upon city gas at 1s. 10d. Is the recommendation of the reduction to 1s. 7d. of last Tuesday the embodiment of a confession that the Gas Committee are satisfied that the manufacturers can prove, or have proved, their case?

Supposing the Gas Committee had not harkened to the voice of reason in this matter, with what were they faced? Their power business amounts to about 15 per cent. of their total output, or 960 million cubic feet; and only on the modest hypothesis that competitors were sufficiently potent to capture one-half of this business, or 7½ per cent., the Committee showed conclusively that, by the shedding of this measure of day consumption, the department would lose some £14,000 per annum. The decrease in business would reduce the manufacturing charges by £40,000; the diminution in income from gas and residuals would equal £54,000 —the difference being the £14,000. The estimated cost to the department of the concessions for large power consumption is £8000. So that the retention of the half of the present power consumption that it is assumed would otherwise be sacrificed (to say nothing of the increase in power business that the reduced price may bring) means a saving of £6000 to go towards meeting the fixed charges. The pellucidness of this manner of putting the Committee's case cannot fail to give strength to their position; and it would have been an unsound financial policy to have let this £6000, or such other proportionate sum as the loss of business would mean, slip through their hands. By the sum of the loss, the heavier would have been the burden of fixed charges (which would have continued the same) upon the other classes of consumers. Therefore, in the interests of those other classes, it is better that something in the way of profit should be saved rather than lost. Let it be remembered that the bulk of the lighting consumption is seasonal; while power consumption is fairly constant—summer and winter—and mostly when gas is not required for other purposes. A "waiting policy" was advocated by certain members of the Council. Procrastination will be the thief of much power business in many places; and after manufacturers have spent capital in putting in plant of their own, the abandonment of high illuminating powers for lower, and consequent decrease of charges by town's gas suppliers, will not easily bring about the return of manufacturers who have made the outlay. The Birmingham Gas Committee have taken the right course in the interests of the city, of its supporting industries, of the gas undertaking, and of all classes of the consumers. The figures prove that the 1s. 7d., less 5 per cent., is not an excessive rebate for consumption of this character.

Several other concerns have lately made reductions for power supply. Among them may be specially noted the Wandsworth and Putney Gas Company. Readers may recollect that for some years past the Commercial Gas Company have been competing for power supply at reduced figures. Of the Wandsworth Company, Mr. H. E. Jones is the Chairman; and the information has just been promulgated by the Board of the Company that the price of gas for power purposes will be subject to 10 per cent. discount—making it a trifle over 1s. 9½d. per 1000 cubic feet. Of course, Birmingham and Wandsworth have not industries of parallel magnitude.

The Education of the Would-be Gas Engineer.

THIS well-worn, but always interesting, subject formed the principal feature in the Presidential Address given by Mr. E. J. Sutcliffe to the Yorkshire Junior Gas Association last Saturday, a summary of which will be found elsewhere. It is satisfactory to note that it was treated with some degree of freshness, inasmuch as stress was laid upon the great and paramount importance of primary education as a groundwork to that scientific and technical training which has come to be regarded as almost indispensable to the making of a present-day gas engineer. In the President's insistence upon this, he has rendered an essential service to the cause that he has at heart, for it is a phase of the question which is but too seldom referred to. Indeed, it has been deliberately assumed by some writers on the subject that a youth may, with impunity, be withdrawn from school at a tender age, and left to complete his education at evening schools after his day's work is done. Where necessity compels such withdrawal, evening schools may prove invaluable, provided there exists the inclination to make use of them; but the advocacy of such a course as a system of education cannot be too strongly deprecated. Education is now within the reach of all; and the cost of two or three years' additional schooling will generally prove to be capital wisely and judiciously invested. If, in addition, this can be followed up by a course of scientific or technical training at some public institution, so much the better. The lad who starts the world thus equipped has an advantage for life over the one who is only able to complete his education by bits and scraps, so to speak.

At the same time, there is no disposition to under-estimate the immense value to the latter of the habit of self-reliance which is fostered and encouraged by the necessity of overcoming disadvantages. How often does it not happen that the poorly equipped youth, dependent only upon his own resources, outstrips in the race others possessed of all the advantages of what is called a "liberal" education? That, however, is a question of temperament and, not seldom, of physical fitness. It can by no means be used as an argument against suitable preparation for entering a profession. For practice in medicine and the law, the necessity for this preparation has long been recognized; architects and accountants have followed suit; and the present tendency is to impose an entrance examination on all aspirants to the profession of engineering, a preliminary to which is the passing of a Public School or University examination. Sooner or later must come the turn of the gas engineering profession, and the establishment at the Leeds University of a Chair of Applied Chemistry, to include the study of the manufacture and uses of coal gas, is a great step in the right direction, which it is to be hoped will find imitators elsewhere. It was a great disappointment to the promoters of the Midland Junior Association that the authorities of the Birmingham University did not see their way to lend the Association a helping hand; and this is perhaps the more noticeable having regard to the somewhat pronounced opinions of the Principal of the University, Sir Oliver Lodge, on the desirability of a more extended use of gaseous fuel. Happily the difficulty which was thus temporarily created was surmounted by the hearty co-operation of the Birmingham Municipal Technical School authorities; and this is certain to be productive of some useful work.

Mr. Sutcliffe's suggestion as to the desirability of having more and shorter papers for discussion may be heeded with advantage by others besides the junior members of the profession to whom it was addressed. Brevity, both in writing and speaking, is more than ever desirable now that there is such an abundance of subject-matter. At the same time, it should not be pursued at the sacrifice of clearness of exposition, though mere padding is not only to be deprecated, but to be sternly discouraged. Another suggestion which is well worthy of being followed up not only by students, but also by all who are in any way interested in the progress of the

industry, is the collection of information from the technical and scientific publications by the method of indexing described in the address. This appears to follow to some extent the lines of the late Mr. W. R. Chester's most useful publication, the "Bibliography of Coal Gas," and may, in fact, be almost regarded as an invitation to further enterprise in the same direction. There is already in course of publication a periodical index of subject-matter relating to general engineering. What is wanted is a similar index relating to gas engineering and its cognate industries, with an annual supplement bringing it up to date. The idea may be commended to any who may have energy and leisure enough to pursue it.

Gas Radiators at the Smoke Abatement Conference.

The Royal Sanitary Institute and the Coal Smoke Abatement Society, who are jointly the promoters of the conference on smoke abatement to be held this week, appear to have taken a rather high-handed course respecting the various types of gas-radiators now on the market. In connection with the conference, as readers are aware, there is to be an exhibition of gas and electricity appliances and smokeless fuel. In the main hall, where the exhibits will be immediately open to the inspection of those attending the conference, the Committee have refused to allow the stand-holders to show any flueless gas-stoves, such as radiators; but they will permit of the radiators being isolated (as though there was something terribly dangerous about them) in an adjoining room, if the makers desire the Committee to comment on them. But this is not the same thing as having these improved forms of heaters exposed directly within sight of the visitors in the main building. In the introduction to the programme of the meeting, it is remarked that "much can be done to reduce the volume of smoke from dwellings, which, in the aggregate, amounts to as much as that from factories, by furthering the use of gas and electricity and smokeless fuel, and encouraging improved forms of stove and grate construction." The Committee are apparently ignorant of the advances that have been made in the radiator type of gas-heater; and their action assuredly does not contain a modicum of the encouragement of which they speak in the programme preface. Moreover, their action will be giving an undue advantage to the electrical radiator for offices, halls, and other places where it is not convenient perhaps to have a chimney, and in which latter-day types of radiators are now largely rendering excellent and economical service. Upon the banishing of these radiators and their isolation, visitors can only put one interpretation; and, therefore, and in view of the unfairness, we are not surprised that the gas appliance exhibitors who have paid for space in the main hall are somewhat vexed over the matter. If it had been considered that the prohibition extended to the improved gas radiators, there is no doubt that, without hesitation, most of the exhibitors would have refused to take space. Clear it is, that it will have influence in restraining firms from showing at future exhibitions promoted by the Sanitary Institute or the Smoke Abatement Society, unless the restriction is removed. It is understood that one firm have withdrawn their exhibits, but whether for this or any other reason we do not know. The promoters have not deigned to explain their action; but we suggest there is yet time to remedy the grievance and injustice.

Gas Fatalities.

Towards the end of November, there were two tragic occurrences connected with gas supply—one in North London and the other at Seaforth (Liverpool). In both cases lives were lost by suffocation or poisoning; and, at the Coroners' investigations, the Juries returned death as having been due to accidental causes. The proceedings at the inquest in the Liverpool case were reported in the "JOURNAL" for the 28th ult.; and in the same issue a report appeared of the first part of the inquiry into the North London calamity—an account of the adjourned proceedings being published to-day. There are circumstances connected with both cases of which note may be made. The breaking of a 3-inch main was the cause of the escape of gas which did the terrible mischief in London; and the evidence of Mr. G. F. L. Foulger, the Chief Distributing Engineer of the Gaslight and Coke Company, and that of Mr. W. C. Wigley, the Divisional Inspector, leaves no doubt as to the breakage being due to depression of the ground through the passing of a heavy vehicle, or through sudden frost (following upon a period of exceptionally heavy wet weather) causing a movement of the ground, or a combination of the two. Heavy vehicular traffic, more particularly since traction by large motors on the roads has become common, has developed into a serious matter for gas undertakings; and it is to be fervently hoped that something of a protective nature will ensue from the Royal Commission on Motor Cars, to which reference was made last week. In the case of the Liverpool disaster, the occurrence was due to a defective compo. pipe, connected with a prepayment meter supply. How the pipe became impaired is not known; but it would seem from the evidence that was given that the flaw which was found in it must have been a gradually developing one.

Ignorance or Carelessness.

This brings us to the point to which we wish to specially call attention in connection with both these cases, and that is the lamentable ignorance or carelessness and want of precaution which witnesses exhibited. "Familiarity breeds contempt." This is seen in the fairly frequent deaths that one reads about in connection with electric plant and wires, and the use of oil-lamps. One of the witnesses in the North London case confessed that, in searching for the source whence the gas came, he lighted a match, and threw it down the coal-hole of the house, and "immediately it went up with a sort of puff, and the garden seemed alight." That was a fortunate result; for one shudders to think of the alternative disastrous consequences of such an act of thoughtlessness. In the Liverpool case, again, two of the witnesses admitted that they had previously noticed the smell of gas; and one of them stated that he had not been the least alarmed by it. There was the warning; but it went unheeded, and there followed the sacrifice of life. Much was made at the inquest of the fact that the Liverpool Gas Company distribute a large percentage of carburetted water gas; but it is carburetted water gas in admixture with coal gas. If it were not so, then the Coroner's gratuitous remark that he did not believe there was any odour from the gas escaping from the leak might have had some ground to justify it. The evidence of two witnesses showed conclusively that there was a smell of gas, so that it could not have been odourless. The Coroner wants the gas endued with a pungent odour; and the jury suggested that the Gas Company should undertake the inspection of consumers' fittings. Neither course would prevent catastrophes where there is such an abandonment of care as in this case. All the energy of gas authorities in impressing the necessity of caution when there is an escape of gas appears lost on some people; just as the lessons supplied by the disasters that have occurred in connection with electricity generation and use and oil-lamps are soon buried in oblivion, until disaster is repeated. Thus there seems to be, while even personal safety is so wilfully disregarded, no certain means of completely averting these melancholy occurrences.

The South Wales Coal Trade.

Following upon the arrangement lately come to by the Conciliation Board for the Federation districts in England and North Wales, by which any possibility of trouble between masters and men has, for the time being at any rate, been averted, comes the welcome news that an agreement has been arrived at in South Wales, in continuation of the one that will expire at the end of this month. The negotiations between the representatives of the owners and the men were of a protracted character; and though perhaps most people regarded a satisfactory settlement as probable, the removal of all uncertainty on the point has caused a general feeling of relief. With such a trade revival as is at present making itself manifest, too much importance cannot be attached to an arrangement that tends to remove the chance of such a catastrophe as the dislocation of the coal trade of the country. The result may fairly be claimed as a victory for conciliation; and very general are the congratulations offered to Mr. W. Abraham, M.P., who was the leader of the men's representatives, and Mr. F. L. Davis, who presided on the owners' side. The net result of the negotiations is the renewal, in all its essential features, for a period of four years, of the existing agreement; but there have, of course, been certain modifications made. The gain to

the men is the recognition of the principle of periodical holidays; the men in all the associated collieries being now entitled to twelve days' holiday per annum, on dates to be agreed upon by both parties. The alteration secured by the owners is to the effect that in future the average selling prices to be ascertained, as factors bearing on the wage rate, shall be the average selling prices of the coal actually delivered or shipped during the period under review, and not, as has hitherto been the practice, the average selling prices of the coal sold. Needless to say, there were many other claims put forward on both sides; but these, in the interests of peace, were ultimately waived, though at one time a breakdown of the negotiations appeared imminent. The principal difficulty in the way of a settlement was the minimum wage; and though this is allowed to remain as before, the masters still feel they are justly entitled to some relief to meet the position that would arise from very low selling prices. One prominent coalowner gives it as his opinion that if trade does not improve, the effect of the agreement will be that a number of collieries will have to stop working; and he points out how South Wales is hampered in not being able to compete with the North of England coalfield. This year, he says, South Wales has lost trade to the extent of between 600,000 and 700,000 tons of coal; whereas in the Northern counties, where there is no minimum wage, the trade has increased by a like amount.

Does Municipal Trading Pay?

This is a question which has been asked time and again, and answered in various ways. Statistics have been compiled and facts marshalled, until the profusion of the one and the other must have gone far to bewilder those persons whose special knowledge of the subject is not such as will allow them to separate the wheat from the chaff. We had thought that, to say the least, the financial gain derived from municipal trading generally was a very doubtful quantity—though even this is by no means the only objection that can be urged against the policy. But it seems that we have been mistaken; for we are assured on the authority of the Rev. P. Addison Devis (who has recently delivered a lecture on the question to a Herne Bay audience) that, taking a wide view, municipal management pays in every direction. From this it will be gathered that Mr. Devis is a "whole hogger," and that he would not confine his attention to such well-worn subjects as gas, water, and electricity. He would like to see the coal supply taken in hand by the municipality; and he is of opinion that the present overcrowded condition in which the poorer town-dwellers live could be best remedied in the same manner. In fact, in so many cases does he think private enterprise either inefficient or very bad, that he claims it must be put an end to for the benefit of the community. To prove that municipal trading is a financial success, he, of course, has recourse to the published statistics of corporation gas undertakings—whatever would the advocates of public ownership do if they had not this particular example to fall back upon?—but we do not notice any mention of electric light figures, or the brilliant results that have been attained by the running of steamboats. Can it be that these figures would have done something to disprove the correctness of his view of the question? The lecture has some interest to the inhabitants of Herne Bay, however, inasmuch as just before its delivery a proposal to purchase the water-works had failed to secure the approval of a majority of the members of the Urban District Council; but though the representatives of the ratepayers have declined—for the present, at any rate—to acquire the water undertaking, Mr. Devis urges the wisdom of municipalizing the gas-works. He argues that usually such concerns are taken over at a cost of 25 or 30 years' purchase of the net dividends; and he goes on to show what an excellent profit Herne Bay would make on the transaction—basing all his figures on a purchase at 25 years. But this figure seems to be by no means a certainty; and thus the handsome returns that are built upon it are somewhat of guesswork. The calculations of advocates of municipal trading have many times before now been responsible for a subsequent unpleasant surprise to those who have been guided by them; and doubtless the same thing will happen many times again. At all events, the ratepayers will probably want to look more deeply into the matter before they adopt Mr. Devis's suggestion that "the wise course is for Herne Bay to enter the ranks of municipal traders."

Sensational Elective Auditors.

A few weeks ago, in a paragraph bearing the above heading, we drew attention to the propensity displayed by certain Elective Auditors to secure a little cheap notoriety by publishing in the local papers particulars of the "dinner bills" of the local governing bodies to whose accounts their official position gives them access. First and foremost of these is, of course, the redoubtable Mr. S. Norbury Williams, of Manchester, though Mr. J. W. T. Morrissey, of Liverpool, is, it must be admitted, a very good second. On that occasion we characterized the former gentleman as "irrepressible;" and he has since that time still further made good his title to this description by another series of articles—on the present occasion dealing with the "feastings" of the Manchester Corporation. These latter effusions might well have been passed over without any notice at all, were it not for the fact that they have called forth a dignified protest from the floor of the Council Chamber, by the highly respected Chairman of the Gas Committee, Alderman Gibson. It may at once be granted that Mr. Williams displays great efficiency in the use of his pen, and that the subject he has made his own is one which affords limitless scope for the exercise of the (to many people) genial occupation known as "playing to the gallery." The question, however, is one that should be dealt with seriously or not at all. Either the outlays incurred are of such a trivial nature as to be unworthy of notice, or they are large enough to demand treatment in some other way than by attempting to bring the Committee into ridicule. In the first place, Mr. Williams divided up, and set forth at very great length, the expenses of the Manchester Gas Committee, under the heads of what he euphemistically termed "Swigs, Smokes, Soap, and Solids;" and having done this, he arrived at a grand total, for eighteen months, of £411, which included £79 for the dinner given by the Committee to the Council on the occasion of the latter's visit to the gas-works in October last year. The sum involved is therefore out of all proportion to Mr. Williams's expenditure of energy upon it; and thus the matter—such as it is—resolves itself into a question of principle. Mr. Williams expresses his disapproval of the principle, while devoting himself almost solely to a vast elaboration of the details. The principle of the thing could surely have been adequately discussed without this laboured attempt to make the Committee a laughing-stock. As Alderman Gibson pointed out, what is done now by the Committee has to his own knowledge been done for the past twenty years; and when he became Chairman, he gave instructions that the "refreshment" expenses were to be kept within £100 a year. He quoted figures showing that the average outlay under this head for the past ten years had been £92 per annum, and that during this time more than half-a-million pounds had been handed over by the undertaking to the relief of the rates, while the price of gas had also been reduced. In the concluding portion of his speech, in which the Chairman alluded particularly to his own position, he completely carried the Council with him; his statement that he had given the best of his energies, ability, and business knowledge to the service of the ratepayers, and that if he had consumed the whole of the amount named for the ten years he would not have been overpaid, being received with loud applause. We are inclined to agree with Alderman Gibson that the citizens have no cause to complain, and that Mr. Williams "is badly in want of a job when he tries to damage a Committee which has done so much for the ratepayers."

A Railway Company as Supplier of Water.

In another column will be found a report of the considered judgment of Mr. Justice Joyce in an action which had occupied him for several days, and which raised an important question as to the right of a company having an interest in two undertakings to obtain water from property originally acquired for one of them and supply it to the other. The plaintiff in the case under notice was the Attorney-General, acting at the instance of, and conjointly with, the Corporation of Hull; and the defendants were the North-Eastern Railway Company, who are also the owners of a dock at Hull. Prior to 1893, the dock in question formed part of the property of the Hull Docks Company; but, under an Amalgamation Act passed that year, it became merged in the property of the Railway Company. Up to Sept. 15, 1905, water required

or purposes of the dock was supplied by the Corporation, under the provisions of their Act of 1897. On the date named, however, the defendants closed the mains, and continued the service themselves from wells or springs on land in their possession at Hessle, which had for many years been utilized for the requirements of the undertaking. This action was declared to be *ultra vires*, inasmuch as, by supplying water so obtained to persons occupying premises within the dock, and to ships within the dock, defendants were really carrying on the business of a water company without possessing the necessary authority for doing so. On the other hand, the defendants contended that they had a perfect right to use their land for any purpose not inconsistent with that for which it was acquired; and as the supply of water was incidental to the carrying on of a dock, they maintained that they were justified in furnishing it. His Lordship, in an elaborate judgment, of which we have only given the outlines, decided, first, that the contention of the plaintiffs that the defendants were carrying on the business of a water company could not be sustained; and, secondly, that they were legally entitled to do what they were doing. They had, he said, a perfect right to purchase or obtain water anywhere on their line, and carry it in tanks to the dock for use there; and why should they not convey it more conveniently, and at less expense, by a pipe or pipes? He confessed his inability to see how what the defendants were doing was *ultra vires;* and he therefore dismissed the action, with costs.

The Growth of Municipal Burdens.

The issue a few weeks since of the 34th annual report of the Local Government Board enabled the daily papers next morning to bring once more under the notice of ratepayers the now well-worn subject of the growth of municipal expenditure and the increased burden of the rates. The Blue-book is bulky, and contains a mass of matter which is of secondary importance to the ordinary ratepayer—indeed, it is almost beyond his comprehension; but there are some tables which are of the greatest possible interest to him. In due course we shall reproduce, as in previous years, some particulars from the portions of the report which bear specially upon gas and water supply. Meanwhile, it may be permissible, in connection with the subject of municipal trading which was dealt with last week, to emphasize once more the fact that the ratepayer of to-day is much more heavily handicapped than was his predecessor thirty years ago. In the year 1874-5, the public rates raised in England and Wales amounted to £19,198,579; whereas in 1902-3, the figure had grown to £50,328,412. While in the former year the outstanding loans totalled to £92,820,100, at the end of the latter year they had reached £370,607,493; being an increase of £277,787,393, against an addition of only £31,080,631 to the National Debt. The rates per head in England and Wales came to 17s. 4d. in 1879-80; in 1902-3, they were £1 10s. 6d. The average amounts of the outstanding loans per head at these dates were £5 7s. 11d. and £11 4s. 8d. respectively. These figures are very expressive; and the wonder is as to how much higher they will go—or rather, perhaps, how much more the long-suffering ratepayer will be able to stand. The burden of the rates has already driven Yarrow's works from the Thames; and it is now reported that those of the Midland Railway Company at Derby may be removed to some small village on the main line between that town and London.

The London and Southern District Junior Gas Association will meet next Friday, when Mr. J. Clark will read a paper entitled, "Some Modifications of the Table Photometer."

Society of British Gas Industries.—Application forms for membership of this Society have been posted. Anyone eligible who does not receive a copy may obtain one by communicating with Mr. Charles Clare, No. 134, Queen Victoria Street, E.C.

Society of Engineers.—At the meeting of the Society on Monday last week (Mr. Maurice Wilson, the Vice-President, in the chair) a paper was read on "The Grindleford Stone Quarries and their Working," by Mr. B. L. Pradley. It may be remembered that these quarries are a section of the undertaking which is being carried out by the Derwent Valley Water Board; and they supply the stone for building the dams. They are 52 acres in extent, and are situate about 10 miles from Sheffield. Their geological formation is one of the millstone grits of the carboniferous system known as the Rivelin. The approximate quantity of good building stone is 2,400,000 tons. The quarries were opened in April, 1902, and the first consignment of stone was dispatched to the dams on June 13, 1903.

SUGGESTED GAS-TESTING CLAUSE FOR BILLS.

Now that the Metropolitan Gas Referees have given the gas industry information as to the test-burner they are going to prescribe in order to comply with the requirements of the London Gas Act of last session, we have the initial step in the course to be pursued to obtain a comparable and uniform method of testing for gas of various qualities and constituencies; and therefore now is the time, and the Bills promoted next session serve as the opportunity, for making a start in developing uniform conditions by the general adoption in these and future Bills of a testing clause framed upon an acceptable model. It needs no argument after all the discussion there has been over this matter, and the unfair treatment that gas of qualities other than 16 candles has been subjected to by a too rigorous adherence to fixed rates and conditions in conjunction with the "London" Argand No. 1 burner, to now accentuate the advantage of, as far as possible, getting and keeping in line as gas companies and other authorities find opportunity. Therefore, we gladly give publicity to the following letter from Sir George Livesey and to the clause which he sent (in response to a request made to him), and which has been adopted for the South Suburban Gas Bill. He publishes it for the "information" of other promoters. It is certainly a simple clause, and appears to cover all the essential points. Sir George's letter is as follows.

SIR,—I now send the testing clause in the South Suburban Bill as settled by the Solicitor (Mr. Blyth) in conjunction with the Parliamentary Agents (Messrs. Dyson and Co.) for the information of those gas companies who are going for testing clauses in their applications to Parliament next session. The clause reads as follows:—

SOUTH SUBURBAN GAS.

The prescribed burner shall be the burner known as "Carpenter's Metropolitan Argand No. 2 Burner," which has been prescribed under the provisions of the London Gas Act, 1905, or such other burner as may be from time to time prescribed under that Act by the Board of Trade. Provided that any such last-mentioned burner shall be of such a pattern (not being an incandescent or similar burner) as shall be practicable for use by the consumer, and shall, with the chimney (if any) to be used therewith, be the most suitable for obtaining from the gas, when consumed at the rate of five cubic feet an hour, the greatest amount of light.

In testing the illuminating power of the gas supplied by the Company, the said Carpenter's Metropolitan Argand No. 2 Burner, or any such other burner and chimney as may be hereafter prescribed as aforesaid, shall be so used as to obtain from the gas, when consumed at the rate aforesaid, the greatest amount of light.

The clause covers all the necessary points, though, as a layman, I think I should have preferred a slightly different arrangement of the wording. But in these matters the professional men most probably know best.

The essentials are the proviso, first contained in the City of London Gas Act of 1868, that the test-burner should be that for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer. Then it has the additional proviso of the London Gas Act of 1905 that it shall be so used as to obtain from the gas the greatest amount of light; and it also has from that Act the further condition that, from time to time, if a better burner should be invented, it may be prescribed by the Board of Trade.

It seems to me that it is advisable to include all these points in the testing clause of every Bill for next session, because it will be the greatest step towards unity of testing that can now be taken.

The Institution of Gas Engineers strenuously contended for uniformity of burner and testing, coupled necessarily with regulation. At that time we all advocated regulation of the flow of gas, and this was vigorously opposed—a fixed rate of burning being contended for. Well the opponents, by conceding the clause in the London Act of 1905, have got the rate of burning fixed at 5 feet an hour; but to burn gas fairly without regulation of some kind is impossible.

Mr. Carpenter has succeeded in the most simple and efficient manner in regulating the air. This is found to be better, easier, and simpler than regulating the gas. The burner is suitable for all qualities of coal gas and all mixtures of coal and water gas, and fully complies with the desire of the Institution for one burner, and one uniform system of testing all ordinary and possibly all qualities of gas.

GEORGE LIVESEY.

South Metropolitan Gas Company,
709, Old Kent Road, S.E., Dec. 9, 1905.

DISTRESS AND THE CHILDREN.

FOLLOWING up the article which appeared in last week's "JOURNAL" (p. 668), stating that no response had then been received to Mr. Henry Woodall's proposal to establish a Gas Industries Benevolent Fund, and his contribution of £52 for the purpose, we have received another letter from Mr. Woodall, which is reproduced below.

SIR,—The failure of my appeal to awaken response on behalf of distressed children, compels me to believe that, in placing my suggestions before your readers, I have not made myself as clear as I should have done; and I am therefore constrained to beg that I may trespass further upon your space in an effort to make good my previous defect.

In the first place, I would remark that my scheme, although perhaps it bore the appearance of rigidity—through my desire to present it in simple form—is elastic throughout. The 1 per cent. on profits—say, 2½d. in the pound—to meet the cost of 3000 children may be reduced to 1d., or ½d., with proportionate diminution in the number of those benefited. The funds would have to be voted by shareholders in general meeting; and the vote of one company would differ from that of another. If, too, at any time it appeared that the need for such relief had ceased, or that abuse had crept into its distribution, the contributions might be allowed to lapse.

Possibly it may be argued that shareholders have not the power so to subscribe. If this be so, the disability may be easily met by an Enabling Act of a few clauses. But no such authority can be necessary, when a body of shareholders vote a specific sum, in abatement of a dividend which is earned, and might be paid; and ¼ per cent. on capital voted once in twelve years would suffice for the maintenance of 1000 children. A company selling 40 millions per annum, and making £3000 profit, would, at 1d. in the pound, subscribe £12 10s. and rescue one child. The child, of course, need not be sought in London; for any of our large cities and towns will provide only too wide a field for selection. Nor is a central authority necessary; for palpably a company may reserve to itself the fullest jurisdiction over its expenditure, and may place the recipients of its bounty in what locality pleases best.

This brings me to the question of housing; and here the outlook is of the brightest. The directors of a gas company and their manager in a small town are always among the best known and most respected in the locality; and, what is of even more consequence, they know as well as any the character and reputation of the poorer residents. Thus, of all men, they are most competent to choose the homes. Knowing what I do of many, I am confident of there being scores of good fellows, who, with their wives, will gladly lend willing hands to aid the object; and this object is a patriotic attempt to withdraw from their debasing environment a number of poor waifs who, in the absence of such help, must in the near future swell the mass of destitute creatures who are already the despair of legislation.

There is a growing demand for the "Colonization of Britain;" and "Back to the Land" is a cry which vibrates, as with vitalizing force, throughout the kingdom. Let us do what little we can to help the movement. The average shareholder in gas undertakings holds about £500, the profit on which is £25 per annum. If one holds more, he is presumably the better able to contribute. Two shillings, then, would be the average contribution per annum at 1d. in the pound; and for this, or at this rate, he may participate in a system which must yield him an amount of satisfaction out of all proportion to the cost. I have had some experience of these city urchins, and can unequivocally say that no money and no labour that I ever devoted to any purpose has yielded me so bountiful a return as that spent upon them.

Let me beg the readers of this to allow their fancies to invade the reeking homes where, in "looped and windowed raggedness," these helpless and unbefriended children shiver and starve; and then to picture them, well clad, well fed, in the gladsome circles of country children, the "fathers" of a contented peasantry. And all this in a thousand instances, Mr. Shareholder, out of your annual contribution of 2s.! Who would not have a share in the rescue of "one of these little ones?"

Llandudno, Dec. 7, 1905. HENRY WOODALL.

We have also received the following letter, antagonistic to the proposal, from a gas manager, who, however, prefers that his name should not be made public.

SIR,—It is surprising that one so conversant with the gas industry as the Editor of its chief organ should be astonished at the cool reception accorded to the extraordinary scheme propounded in your issue of Nov. 28 by Mr. Henry Woodall, of Llandudno. Mr. Woodall has been so many years "out of harness" that one can excuse his failure to appreciate present-day conditions which render the life of every conscientious gas manager one of strenuous effort and of continual anxiety. But he cannot be unaware of the existence of the Institution of Gas Engineers, or of the continually recurring cases of necessity and of distress among the less fortunate members of the profession which can only be very slightly alleviated by assistance from the slender resources of its Benevolent Fund.

The needs of London's poor children are already very much looked after—instance the numerous agencies in existence, to any one of which Mr. Woodall's £52 would be a useful contribution. In most larger towns there exist organizations which do for the children far more than is done for the relief of adult distress. Such a new departure as the ambitious project of our leisured friend would not only clash with, and injure, existing institutions, but—if directors, managers, and secretaries could be found to undertake the work—would necessitate the reorganization of office staffs, and such an increase of work to already overburdened officials as would render their position intolerable.

No, Sir, if the warm-hearted interest which prompted this scheme really has benevolence for its object, it can satisfy its yearning to "help the children" without laying the last straw of vexatious demand upon the overtaxed energies of gas managers, whose curses—deep, if unheard—would surely follow any scheme of benevolence by such means.

GAS MANAGER.

Another Link with the Past of the Gas Industry.

In the "JOURNAL" for the 7th ult. (p. 367), reference was made to the existence, in the person of Mr. R. Laybourne, the Chairman of the Newport (Mon.) Gas Company, of a link between the present and the past of the gas industry; this gentleman having in his youth been connected with a firm who carried out large contracts for Mr. Malam. We are reminded, by the entrance last Friday into his 84th year by Mr. Magnus Ohren, that there is one more of these links. Mr. Ohren entered the gas engineering profession at the age of 16, when he became a pupil of Mr. Geddie Pearse, the Engineer-in-Chief of the British Gas Company, whose London works were in School House Lane, Ratcliff. He remained with the Company till 1846, when he went to Hamburg to assist in lighting the city, in which work he was successful. He returned to England in 1850, and was re-engaged by Mr. Pearse. At that time the Company were short of holder room, and had great difficulty in storing the gas. Mr. Pearse accordingly wrote to Mr. Wright (now Messrs. Westwood and Wrights) to consult him on the matter; and Mr. Ohren was present at the interview. Mr. Pearse remarked that he had no room for another holder; but he said, "Do you think we could make a smaller holder to go into the old one like a telescope?" "I never thought of that," said Mr. Wright; "but I will think it over and let you know." He did so; and the result was that he invented the system of cupping, which proved successful. Consequently Mr. Ohren saw the first "telescope gasholder." Then the Company came to grief with a short supply of gas, and had no room for one more retort. This, of course, brought time after time so many complaints, that Mr. Pearse was obliged to say he could do no more. Mr. Ohren then heard that the Commercial Gas Company had bought the Ratcliff works, and would supply the district from Stepney. He was the only officer taken over, and was appointed Superintendent of his old district as well as Millwall, where the Commercial Company had special works. One day he reported to the Engineer that the supply at Millwall was very bad. The Engineer said he knew it was, and added that the Directors were going to build new works there. Mr. Ohren thought it was a pity to do this, and suggested that the place should be supplied from Stepney. "My dear sir," said the Engineer, "you forget that there are two waterways to cross." "I know that very well," was Mr. Ohren's reply, "but I could get over it;" and he told him how to do it. The matter was reported to the Directors, and Mr. Ohren was asked to make an estimate of the cost. He did so, and sent in a sum which included the charge for putting down a 10-inch main in the East India Road. The pipe was satisfactorily laid, and is doubtless working well to the present day. Soon after this, Mr. Ohren was appointed Manager of the Crystal Palace District Gas Company's works; and, as our readers may remember, he afterwards became Secretary, and remained with the Company till he retired on a pension. We cannot close these reminiscences of Mr. Ohren's early work without offering him our hearty congratulations on the event which suggested them, and expressing the hope that he may for some time yet be numbered among the few remaining representatives of the past of an industry which they have lived to see occupying a position which probably they never thought that it would attain.

The first application of the thermit process for pipe-welding has recently been made in New York City for a refrigerating company. The pipes are laid in the ground and are used as service return-pipes in the delivery of liquid ammonia—at 180 lbs. pressure—to various cold-storage houses along the street. Twenty-nine 1¼-inch and twenty-seven 2-inch joints were welded. The pipe was welded on the ground to lengths varying from 40 to 100 feet, then placed in the ditch, cuts made for connections, and the final welding done with the pipe in place. On the 2-inch line, an expansion band was placed; while on the 1¼-inch this was not thought necessary.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 767.)

THE course of things on the Stock Exchange last week was changeable and uncertain. The opening was nervous and uneasy, and heavy Continental selling produced apprehension. But next day it appeared that the sellers were buying back; and the alarm abated. The tone grew firmer, but the position still remained sensitive. Thenceforward there were alternations of dullness and recovery, with a tendency to firmness prevailing at the close. In the Money Market, the supply was superabundant—in excess of all requirements. On Thursday, the discount houses reduced their rates on deposits by ½ per cent. Short loans continued very easy all the week; but for bills, the tendency at the close was firmer. In the Gas Market, business was, on the whole, lighter than it had been for the past few weeks; and on one or two days it was decidedly quiet. The general tendency was good and firm. Changes in quotation were few in number, and slight in degree; but nearly all of them were in the upward direction. Indeed, the only two exceptions to the rate were secured issues, which, as a class, are not affected by the same influences as the open stocks. In Gaslight and Coke issues, the ordinary was strong, and the quotation advanced half-a-point. Transactions were quieter, but at good figures; the range being from 101¼ on the opening day to 102¼ on Saturday, which means that the stock is approaching a 4¼ per cent. price for money. And there is no reason why it should stop here. The outlook for the Metropolitan Gas Companies has improved in the current half year, notably in respect of the market prices for their residual products, which had been ruling very low for some time past, and gave no promise of improvement. The secured issues of Gaslight and Coke were weaker; and the maximum and preference both receded slightly. The former changed hands at 90 and 91; the latter was not dealt in; and the debenture marked 88¼ and 88½. South Metropolitan was moderately dealt in at steady prices, which ranged from 132½ to 133½, a small amount being done "free" at 132. The debenture changed hands at 87½. In Commercials there were dealings in the 4 per cent. at from 116½ to 117½; in the 3½ per cent. at 112½ and 113¾; and in the debenture a small amount "free" at 86. There was hardly anything done in the Suburban and Provincial group. British was marked at 43¼, Bromley "A" at 120, South Suburban ordinary at 124, and West Ham preference at 125. The Continental Companies furnished their full proportion of the business done. Imperial was active and steady; and the price seems to have settled down at the advance prompted by the new capital adjustment in hand. Business was marked at from 234 to 236. Union was done a few times at from 129 to 130, and the preference marked 146½. European was not dealt in. Tuscan changed hands at 9¾ and 9 13/16. Among the undertakings of the remoter world, Bombay part-paid was done at 5¼, and Oriental at 148½ and 149. Cape Town marked 17 1/16 and 17⅛, Buenos Ayres, 12⅜ and 12½, Primitiva 7 and 7⅛, ditto preference 5⅛ to 5¼, and ditto debenture 97¾. River Plate changed hands at from 12⅞ to 13 1/16, and San Paulo at 13¼.

The closing prices are shown in our Stock and Share List on page 767.

ELECTRIC LIGHTING MEMORANDA.

The "Absurdities" of Municipal Trading—The Truth as to the Economy of Incandescent Gas Lighting—A Traditional Argument—Disastrous Municipal Trading in Electricity in America.

THE students of the Manchester Section of the Institution of Electrical Engineers have been treated to an address by Mr. James Swinburne on the subject of "Efficiencies;" and in the course of what to him was an agreeable exercise, he dealt with the "absurdities" underlying the conditions upon which municipal electricity concerns have to work. But if the report before us is a complete one of his address, he failed to tell his audience anything as to his views of the "efficiency" of municipal administration under the circumstances which local authorities are compelled to accept, nor did he say anything as to the "absurdity" of municipalities going in for schemes which have to be worked under "absurd difficulties." He complains that "a town does not save money like the private individual, and then buy what it can afford;" and he does not think that "it would be allowed to do such a rational thing." We fail to see the rationality of the idea in the case of municipal trading enterprises. Our municipalities are not built with providence as part of their nature; and, supposing they were, whence is to come the money which they would save? For these trading enterprises, the whole of the money that would be "saved" to furnish the capital would have to be drawn from the whole of the ratepayers; and then what a high time the consumers would have in getting their requirements satisfied on capital unburdened by sinking fund and interest, for the municipality would be compelled to supply them cheaply, feeling as they do now the pinch of keenly directed competition. But such manner of getting money would not be very encouraging to private enterprise, nor to the general body of ratepayers. Mr. Swinburne himself points out the inherent weakness of his "saving" scheme for capital purposes, when he says that the ratepayers are at present shareholders by compulsion. They would be even more so by having to directly provide the money that would be saved. Mr. Swinburne suggests that the only way to avoid being shareholders in these "compulsory undertakings is to live in a barge upon a canal." We suggest to Mr. Swinburne that there is a transposition of the word "compulsory" when applied to electric light undertakings. The undertakings are not "compulsory;" but the ratepayers are "compulsory" shareholders, and their "dividends are generally negative." We are among those who think that the right time for a municipal concern to save is after the starting of the business; and by working it on profit-producing lines without compulsory support from the ratepayers. The savings could be used for plant replacements, and so prevent the undue inflation of capital that is now proceeding with such alarming alacrity. In this connection we have at last detected a flaw in Mr. Swinburne's knowledge. He stated that a certain clause which he does not name (but we will by way of guess designate it the Bermondsey or Northumberland clause), has been solemnly inserted in "one or two" Acts by the collective wisdom of the country. It is evident from this that Mr. Swinburne has not kept himself fully abreast of parliamentary proceedings, or he would have known better than to mislead the students in this manner.

We cannot tear ourselves away from this interesting address of Mr. Swinburne without giving the information that he imparted to the students on the perennial subject of the comparative costs of artificial illuminants. Mr. Swinburne, as we recently indicated, stands head and shoulders in front of any other electrician who has made public statement on this matter in his impartial—the word "impartial" should be accentuated—acknowledgment of the economy in cost of incandescent gas lighting; but it will also be remembered that, for interior lighting, he goes beyond price to show that, as is quite natural, in his opinion, preference should be given to electricity. Mr. Swinburne evidently takes the enlightened view that it is no use trampling on the truth, but that its full recognition by electricians will be an incentive to greater vigour in trying to contract the margin that now exists on the point of economy between the two illuminants. The volatile mentor of the electrical industry gave some figures at the Olympian exhibition; and they should be read (*ante*. p. 163) in conjunction with those he now advances. Then he said that the incandescent gas mantle gave about 18 candles per cubic foot of gas consumed per hour; and the result was that, on this comparison, every 1d. per unit paid for electrical energy corresponded to about 6s. for gas, and thus electricity at 3d. per unit would correspond to gas at 18s. In the address under notice, he stated that, with electricity at 4d. per unit, an ordinary glow-lamp will give nearly 800 candle-hours for 1s.; and a flame arc, with energy at 3d., 14,000 candle-hours. Thus it will be seen that, accepting these figures of Mr. Swinburne, on this basis alone, the flame arc and the high-pressure gas-lamps come out about equal in price. But (there are always a number of "buts" where electricity is in question), adds Mr. Swinburne, the shilling is all spent on energy, and nothing is allowed for renewal of lamps, interest on fittings, meter-rents, interest on arc lamps, and cost of carbons and labour. It is important to note this, and to remember, too, that the flame arcs have disadvantages which are not present in high-pressure gas lighting. Then for 1s., with energy at 5d. per unit, the same light can be obtained with ordinary glow lamps as with the flat-flame burner and gas at 4s. The gas-mantle, however, makes an enormous difference, and brings gas at (say) 3s. ahead of everything, but the mercury and flame arcs at (say) 4½d. a unit. Then the impartial electrical critic further falls foul of electric lighting. He points out that many other factors have to be taken into the calculation. There is the interest on the mercury lamp for one thing. Its colour is not good; and if carbon lamps are added, the efficiency goes down. We will let Mr. Swinburne have whatever worth is attached to his next remark: "On the other side, however, you have to estimate the cost of mantles, the trouble and worry of breakages, and of the jets getting stopped up, and so on." There is room for magnanimity on our part, because our electrical friend agrees that "even then, it must be clear that the mantle has a large margin for economy over the house lamps such as the Nernst and the carbon incandescents." On the other hand, it is asserted that, for outdoor use and for large buildings, the flame arc lamp "seems" to have plenty of margin over the mantle, though large mantle lamps are even better than some of the smaller ones. The manner of framing this sentence is a poor attempt on the part of Mr. Swinburne to conceal his feeling that the high-power incandescent gas-lamps are by no means those contemptible things that some electricians would have their fellows believe. The statement, in fact, when one looks under the surface, is eloquent indeed.

But the crushing blow by Mr. Swinburne has yet to be noticed. It is the traditional argument that has come down from the years of the old flat-flame gas-burners, as to the evil effect of gas on decorations. Mr. Swinburne trotted this out as though it was something new at Olympia. He now asserts that the argument annoys the gas industry; and from this false premiss draws the illogical conclusion that "so it is sound and good." Mr. Swinburne must have been still in his professional pupilage days when electrical people were trying to oust gas for interior purposes by

vainly quacking in this style. Its success has not been great, and there has been a wonderful change since then that knocks the "soundness" and "goodness" out of the resurrected argument. It would be interesting if Mr. Swinburne would, the next time he turns to the subject, do the gas industry the honour of noticing this point—that whereas, when birth was given to his argument, and for many years after, it was necessary to use, to get a light of 50 candles in a room, five or six burners, each consuming 5 cubic feet of gas per hour, or in all 25 to 30 cubic feet, the same illuminating power can now be obtained by using in the incandescent burner, on Mr. Swinburne's own showing, a fraction over 3 cubic feet of gas per hour—in other words, only from one-eighth to one-tenth of the former consumption is required. If Mr. Swinburne would be as fair over this as he is over the cost, it would make the case he puts forward for gas complete. Perhaps, however, it is his only guard against being anathematized and called apostate by ill-natured electricians. But *veritas vincit*.

Maybe it will be refreshing to the spirits of local authorities upon whom the results of speculative embarkation into electricity supply sits heavily, to learn that the municipal authorities of America are largely in the same boat, but with the difference that many of them know when they have had enough, and take steps to "cut" their losses, instead of year after year continuing to pile them up, or to strain to effect their concealment. Anyone who has taken the trouble to read the article on "Municipal Trading in America" in our "Miscellaneous News" last week, will see how completely the experiences in the municipal running of electric lighting concerns in the States coincide with those in this country. There have been heavy losses on working, so heavy that rates have had to be increased to such a degree that municipal trading has got into very bad odour in many communities, and the representatives of the people have been made to plainly understand that the people are their masters, and not they of the people. Exactly as in this country, too, estimates of the capital cost of installation have afforded no approximate notion as to the real cost of installation, and dollars have been multiplied several times between the estimated and the actual before the work has been completed. Then the cost of supplying the public lamps has gone up in many instances in the struggle to make ends meet, and cases are cited where the expense for this public service is greater than with lamps supplied by private companies. That, however, is not the rule in this country, though—if incandescent gas lighting had not put the municipal owners of electricity works into such a state of consternation, and if they dealt with the public lighting as they do with other customers for current for lighting, and did not supply it at in cases unremunerative prices—the cost per electric lamp for public lighting in this country would also have had an upward trend, until, of course, lamps consuming less current were reliable, and did not entail so much labour in maintaining them in working condition. Again, the provision of a depreciation fund does not appear to enter into the financial arrangements of many American cities; and "JOURNAL" readers need not be told that this is not an unusual circumstance with the majority of our own pauperized municipal electrical concerns. Several American cities have, by the forcible lessons of time, been brought to an understanding that the warnings of those whom they had been prone to regard as Jeremiahs were not without foundation. Unserviceable and obsolete plant is now standing with large undischarged debts upon it, which unrepresented debts are a weighty burden upon already much depressed undertakings. There are home undertakings the administrators of which have appreciated that the assigned periods for repayment are altogether in excess of the valuable working life of much of the plant; but many of those—and they form the greater number—who will not, in most cases for patent reasons, recognize this will inevitably find their position by-and-by reflecting the distressing case of not a few of the American concerns. But as the article shows, several of the American municipalities are relieving the communities of continual loss by such drastic measures as selling and abandoning their undertakings; this being the only and the shortest cut to relief. They realize failure, and do not veil it by adopting the notorious miserable devices practised in this country. The article which presents us with these illustrations of disastrous municipal speculation in America should really open the eyes of those who have hitherto blindly refused to see what is so plain, and should have, before disaster chastens, a retarding effect upon others who aspire to ownership.

The Font Reservoir Works at Tynemouth.—Last Thursday, Mr. F. R. Hull read before the Newcastle-upon-Tyne Association of Students of the Institution of Civil Engineers a paper on "The Font Reservoir Works for the Water Supply of Tynemouth," the carrying out of which he has supervised. He stated that the general scheme had been to impound the waters of the River Font in a reservoir to be constructed in the Font Valley, and, after filtration, to deliver them by means of a gravitation main into the service reservoirs of Tynemouth. The present population of Tynemouth and surrounding districts was about 60,000; and the average quantity of water used daily per head was 20 gallons. The storage capacity of the reservoir was 720 million gallons, or about 170 days' supply, assuming the daily flow of the river to be nearly a million gallons in the summer. Mr. Hull mentioned that the undertaking was giving employment to 250 men; while during the past two years the value of the work executed exceeded £100,000.

REMOVAL OF NAPHTHALENE FROM COAL GAS.

By WILLIAM YOUNG.

The prominent features of the elaborate and comprehensive accounts of the investigation into the solution of the naphthalene problem submitted to the Michigan Gas Association by Messrs. A. H. White and S. Ball last year, and by Messrs. White and D. H. Clary this year, were the experiments made by the former to ascertain with exactness the weights of naphthalene required to saturate a given volume of gas—in other words, the weight of naphthalene that could be held in diffusion by a given volume of gas at different temperatures; and by the latter the experiments to ascertain the weight of naphthalene vapour that could be absorbed by a given weight of tar out of a gas, or the weight of naphthalene that could be held in solution by the tar at different temperatures.

When the original table of the weights of naphthalene required to saturate a given volume of gas, compiled by Mr. R. W. Allen, M.A., and upon which the investigations by Messrs. White and Ball are said to be based, appeared in the "JOURNAL,"* I contributed an article to your pages [†] in which attention was drawn to the divergence of the figures given from harmony with the known laws of the diffusion of the vapour of volatile substances, such as naphthalene, through gas, and making suggestions as to how the divergencies might be corrected. I then went on to say:

> But even allowing the figures to be absolutely correct, they do not furnish the necessary information to enable us to assess the actual value as an illuminant of the naphthalene usually present in coal gas. A great many other factors have to be taken into consideration before we can arrive at that information. The table supplies us with the quantity of naphthalene that can be held in diffusion at any given temperature by what may be termed a dry permanent gas, out of contact with any substance having a solvent affinity for the naphthalene. These conditions do not, however, obtain in the case of illuminating coal gas. During the process of condensation, the naphthalene is in contact with the gas associated with a great many other hydrocarbons, some having higher and some lower vapour tensions; and it very largely depends upon the relative proportions in which these other hydrocarbons are present, and the manner in which the heterogeneous mixture is cooled or condensed, how much of the naphthalene is left in the gas. Just in proportion as the condensable solvents for naphthalene rise or fall, and the solvent power is allowed full play, or is restricted by the method of condensation, so will the quantity of naphthalene left in the gas fall or rise; and just in proportion as the volatilizable hydrocarbons rise and fall, and the condensation is conducted so as to lead to the volatilizing of the largest possible quantity into the gas, so will the naphthalene be partially replaced, and what remains will be accompanied by vapours which will take it up in solution, and prevent its being deposited as a crystalline solid, giving trouble if the gas should be subsequently exposed to low temperatures. We thus see that the quantity of naphthalene usually present in a gas is a variable quantity, and that gases even saturated with naphthalene might not give any trouble, providing suitable hydrocarbon vapour were present in the gas along with it, to take it up in solution on its being deposited. When, however, very high heats are employed to carbonize certain classes of coal, the condensable and volatile products are so small in relation to the volume of gas, and the quantity of naphthalene in the products is so large, that, even with the most perfect system of condensation, it is almost impossible to prevent the gas leaving the manufacturing plant otherwise than highly charged with naphthalene vapour; and the quantity of volatizable hydrocarbons present in the gas is necessarily quite inadequate to prevent the naphthalene being precipitated in the solid crystalline state. . . . The additions of the vapours of a liquid hydrocarbon having an approximate vapour tension to that of naphthalene (xylene) would prevent the naphthalene being deposited in the solid state; but it would not prevent its being deposited. Indeed, it would increase the quantity thrown down, due to the fuller saturation of the gas by the added vapours leading to the precipitation taking place at a slightly higher temperature.

Very similar remarks would apply to the tables of the experimental results of the solvent powers of the tar for naphthalene at different temperatures, supplied by Messrs. White and Clary in this year's report. Even allowing the figures they give to be correct, which (for some of the reasons already noted in your pages, as well as others to which it is unnecessary at present to refer) they are not, they would be of little practical value in showing the actual conditions obtaining in the ordinary process of condensation, and certainly would not support the deductions drawn from them by Messrs. White and Clary.

To bring about the same conditions as those existing in the case of the experiment on the solvent power of the tar for naphthalene at the temperature of 161° Fahr., it would be necessary, in the process of carbonizing the coal, that there should be produced from a ton of coal, along with the gas and other products, upwards of 60 lbs. of naphthalene, which could never be the case in actual practice.

Then, again, if the figures given in last year's tables of the weights of naphthalene vapour that can be held in diffusion through coal gas at different temperatures be compared with the figures in this year's table of the weights of naphthalene that can be taken up and held in solution by the tar at similar temperatures be compared, it will be observed that the rates at which the naphthalene diffuses through coal gas rises with the increase

* See "JOURNAL," Vol. LXXIV., p. 595. † *Ibid.*, p. 755.

of temperature much more rapidly than does the solubility, or rather the absorbent power, of the tar for the naphthalene vapour. While the weight of naphthalene that can be dissolved by the tar is between five and six times as much at the temperature of 161° Fahr. as it is at 72° Fahr., the power of the gas to take up naphthalene vapours and hold them in diffusion, rises between thirty and forty times with the same rise of temperature; and as the relative proportions of naphthalene held respectively by the tar in solution and the gas in diffusion at any given temperature during the process of condensation is the balance or equilibrium between these forces, it follows that the power of the tar to absorb and dissolve all the naphthalene out of the gas must fall with rise of temperature, and not rise as claimed by Messrs. White and Clary.

The tables giving the weights of naphthalene that can be taken up and held in diffusion by gas on passing it through a mass of naphthalene, and the weight of naphthalene that can be absorbed and held in solution by the tar, from a gas kept saturated by naphthalene vapours at given temperatures, have their value. But as the conditions obtaining in practical gas manufacture are never such as these, and are different in different works, dependent upon the kinds of coals used and the methods and temperatures of carbonizing, condensation, &c., they do not supply the information desired by the practical gas manufacturer. What he wishes to know is, how these forces of solution and diffusion act under the varying conditions obtaining in the ordinary process of gas manufacture and distribution, so as to help him in regard to the solution of the naphthalene problem.

In a paper I had the honour to contribute to the Gas Institute, at their meeting in 1900, on "Naphthalene from Retort to Point of Deposition,"* an attempt was made to elucidate this subject on these broad lines; dealing more with the fundamental principles involved, as deducted from observed facts and results, than with any detailed experimental figures. In considering the causes influencing the action of the two forces under consideration, attention was prominently directed to the force of crystallization possessed by naphthalene in modifying the action of the force of absorption and solution. Reference was made to the fact that all the hydrocarbons which are present in the tar, and which are liquid at ordinary temperatures, are soluble, or at least miscible, in each other in all proportions, and remain equally diffused through each other when mixed. With naphthalene, the state of matters is very different—it is only soluble in the liquid hydrocarbons in definite proportions at given temperatures; that on the temperature falling, the excess in solution is separated by the force of crystallization as pure crystalline naphthalene.

Another characteristic of naphthalene is that it can pass direct from the state of vapour to that of a crystalline solid, even from a gas having diffused through it the vapours of higher tensioned hydrocarbons in such quantities that, if only a small percentage of these were reduced to the liquid form, they would be sufficient to dissolve the whole of the naphthalene present in the gas. But that the naphthalene, upon assuming the crystalline state, loses its solvent power for these vapours is evidenced by the fact that gas of high illuminating power may be passed through a mass of crystalline naphthalene without suffering loss of illuminating power. On the other hand, all liquid hydrocarbons, such as have a vapour tension similar to that of naphthalene—even the liquid oils that have been distilled along with the naphthalene, and have been separated from it by cold and filtration—when brought into contact with the gas at once absorb the illuminating hydrocarbon vapours of higher tension, as shown by their loss of illuminating power.

Had the naphthalene retained its solvent powers in condensing out of the gas, like the other similar tensioned liquid hydrocarbons, the naphthalene could not have been deposited in the crystalline form, as it would have absorbed, and reduced to the liquid state, such a quantity of the vapours of the other liquid hydrocarbon solvents of higher tension, as to have prevented it condensing as crystals. It was pointed out how this loss of absorbent power by the naphthalene, on assuming the crystalline state, interfered with the counter-current principle of fractional condensation, by leading to the deposition in the terminal of the condensers of the naphthalene as crystals; and the advantages derived by the ingenious reversible condensing arrangement devised by Mr. Charles Carpenter—whereby the warm tars in a fine state of division, with high solvent powers, were employed to dissolve these deposited naphthalene crystals, and carry them to the tar-well—was explained.

Attention was then directed to what had also been observed—that in those works which were provided with condensing arrangements in which the warm gas and products were suddenly cooled, and the tar vapours in consequence reduced to the liquid state in an extremely fine state of division, these tar particles were carried forward in the current of gas till they were so reduced in temperature that they were able to absorb and dissolve most of the naphthalene vapours, and that those works were, in consequence, comparatively free from naphthalene trouble arising from crystalline deposit, either in the manufacturing plant, mains, or services—thus demonstrating most conclusively that the tar had a greater power of absorbing the whole, or nearly the whole, of the naphthalene vapours when kept in contact with the gas till both were comparatively cold, than when the tars were removed from all contact with the gas during the process of fractional condensation while warm. It was further explained why, under the modern conditions of the manufacture of gas, the full solvent powers of the tar might be safely employed without almost any appreciable loss of illuminating power of the gas.

The loss of the absorbent power of the naphthalene, on assuming the crystalline state, for the vapours of the higher tensioned hydrocarbons, also explained why it was necessary, in order to prevent the naphthalene present in the gas from being deposited in crystals, to charge the gas with the vapours of hydrocarbons having a similar tension to that of naphthalene, so that they would condense out of the gas as a liquid along with the naphthalene, and take it up in solution on simple fall of temperature. It might further explain why there might be an abnormal difference in the absorbent power of the tar for the vapours of naphthalene than for the vapours of liquid hydrocarbons; for, as is well known, the force of crystallization in the case of naphthalene in the presence of such solvents falls as the temperature rises. The absorbent power of the tars might thus rise abnormally in consequence of being dependent upon the two forces of crystallization and solution. If so, then the quantity of naphthalene that could be absorbed by tar or other hydrocarbon solvents would be the equilibrium of the three forces of crystallization, solution, and diffusion of the naphthalene vapours through the gas at given temperatures.

Having thus dealt with the fundamental principles, and explained how these three forces came into play during the process of the manufacture and distribution of the gas, in such a way as to lead to the deposition of the naphthalene so as to give trouble the paper went on to explain how these troublesome naphthalene deposits could be prevented, and the trouble avoided, by the use of a supplementary supply of suitable hydrocarbon solvents. It described the sources from which this could be obtained, or how they could be specially manufactured for the purpose; also how they should be used to treat the naphthalene-charged gas by the further application of the several forces that had been previously considered.

My reason for writing this article, which is practically a *résumé* of former communications, and my excuse for asking space in your pages, is that—judging from the report of the experimental research work, and the deductions drawn from the results by Messrs. White and Clary in America, and from the remarks made regarding those researches and deductions which have appeared in your pages and those of your contemporary the "Gas World"—it appears to me that the dominating influence of the force of crystallization possessed by naphthalene differentiating it, in its behaviour in relation to the other liquid hydrocarbons in following the general laws of solution and diffusion, has not received the attention it should get in order to arrive at a sound conception of the fundamental principle involved in the naphthalene problem. I also feel that they warrant me in again drawing attention to the fact that the published results of the researches of my colleagues (Messrs. S. & T. Glover) and myself, into the fundamental principles involved in the solution of the naphthalene problem, have anticipated those made in America, and also the numerous claims made by others in this country, for the prevention of naphthalene troubles, by directing attention to the methods of conducting the process of condensation so that the tars will be allowed to exercise their maximum solvent-power for naphthalene vapours, and the importance of leaving in the gas as large a quantity as possible of the naphthalene solvents with a similar vapour tension to that of naphthalene. In cases where the liquid hydrocarbon solvents present in the tars produced from the coal, along with the gas, were not sufficient in quantity to effect these purposes, then, by the use of a supplementary supply of hydrocarbon solvents derived from other sources which naturally possess the solvent power for naphthalene, such as blast-furnace or water-gas tars, or solvents which were specially made or prepared for the purpose, including the early parts of the distillate of coals, tars fractionated and freed from naphthalene, which would not only act as solvents for washing the naphthalene out of the gas but would also charge the gas with the vapours of volatile solvents, which would prevent the naphthalene from being subsequently deposited in solid form.

While, however, making these claims for my colleagues and myself, I yet welcome the research works of others, and more particularly when that research work supports the previous work of my colleagues and myself. It is also gratifying to learn of the increasing practical application of the processes resulting from our research work. This gratification, however, is somewhat marred by the disposition shown by some to ignore our original research work, or—worse—appropriate it as their own. And it appears to me that Messrs. Glover and myself have more and better cause to complain than those quarrelling among themselves regarding their individual claims to that which they have appropriated, and which belongs to none of them.

The Manchester and District Junior Gas Association will meet next Saturday to discuss a list of eight questions which have been sent out to the members. The subjects to be thus dealt with are of a varied character; and the proceedings should be interesting. The first query, we notice, is: "On what lines should a gas department work to compete with the installation of suction-gas plants for power purposes?"

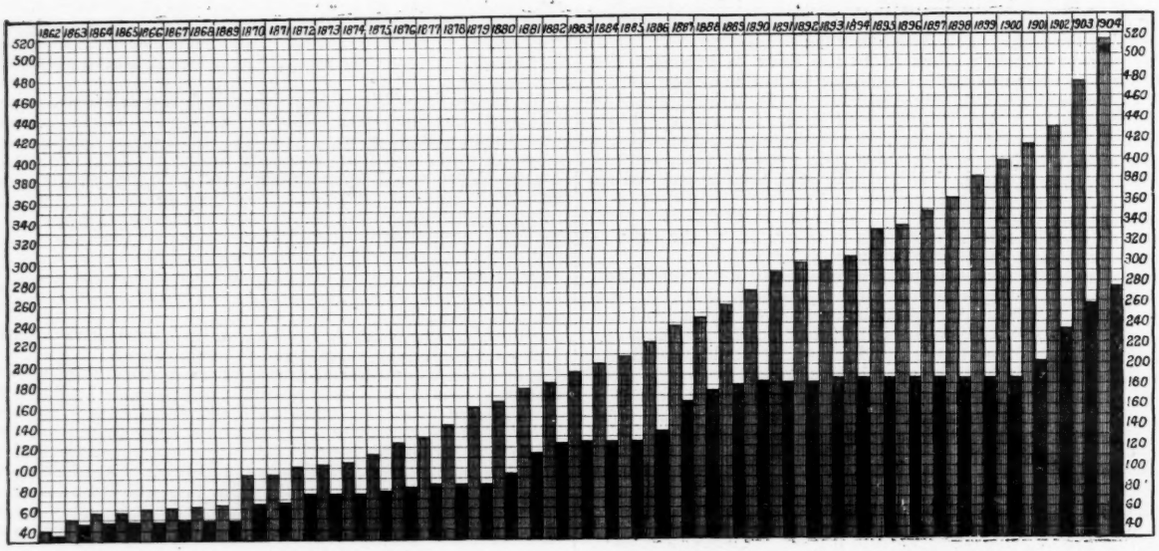
* See "JOURNAL," Vol. LXXV., p. 1712.

GAS BUSINESS DEVELOPMENT AND AN ACCOMPANYING NECESSITY.

Central Offices and Show-Rooms—Their Use and Work, with Illustrations from Reading.

Among the changes that have come over the gas industry with increasing prominence during the last few years, have been two to which a little attention may be devoted in this article. The one is the altered character of the gas business, and the developments it has brought in its train; and the other that, coincident with this change, there has grown up a greater necessity, through the increase in competitors and their keenness in rivalry, for keeping in touch with consumers, for informing them, for making provision for their requirements, and for pleasing them, and, added to these things in the case of those who are not yet consumers, the power of conviction and almost of anticipating wishes. These two changes have in a sense a relationship; and they have added what is really a new department to every gas undertaking's work, and have laid heavy claim upon the time of the chief officials in a manner that, if the whole of the present progress had been dumped on them at once a decade or two ago, might not have been regarded in the most gracious light. On reflection, we find here a lesson of the marvellous effect of gradual growth. These claims upon the time and the ability of the chief officials—more especially of the engineer and manager—and the imposition of new work, have been a kind of exogenous growth; and it is only because of this character of the additional duty, within and outside the works, that it has been possible for the chief official to deal with it without neglecting any of his many other responsibilities. Truly the capacity of a gas engineer and manager seems only limited by health and time; but these limitations do not always appear to fall within the range of recognition of Directors and Committeemen.

This, however, is merely a digression from the subject at present in hand. We were remarking upon the two changes in a gas undertaking's business in respect of the increase in its variety and extension of each branch, as well as the fact that there have grown up potent competitors which have not allowed gas to pride itself upon an undisputed possession. The synchronizing of these two great changes has hardly been sufficiently appreciated; and if, as we consider these simultaneous happenings, a little head is given to thoughts, one wonders what the gas industry would have grown to if there had been no competition—if all the business that the competitors have secured had been added to the mighty increase that the gas industry has garnered during these years of sharp and strong competition. The pace of advance, under competition, has been remarkable; the pace without competition would in all probability have been burdensome. When we come to look at the question of competition in this light, we are not altogether sure that the putting of the officials and staff of a gas undertaking on their mettle is the only advantage that has accrued from the competition. However that may be, the gas industry had the lead; and it has not only maintained it, but it has doubled its volume of business in the past score years, and in individual cases there has been a trebling and quadrupling during the competitive times—in great part as the result of the new classes of business which, though new, are still subordinate to the old kind in its



Black columns show capital employed in thousands of pounds per annum; lined columns show gas made in millions of cubic feet per annum.

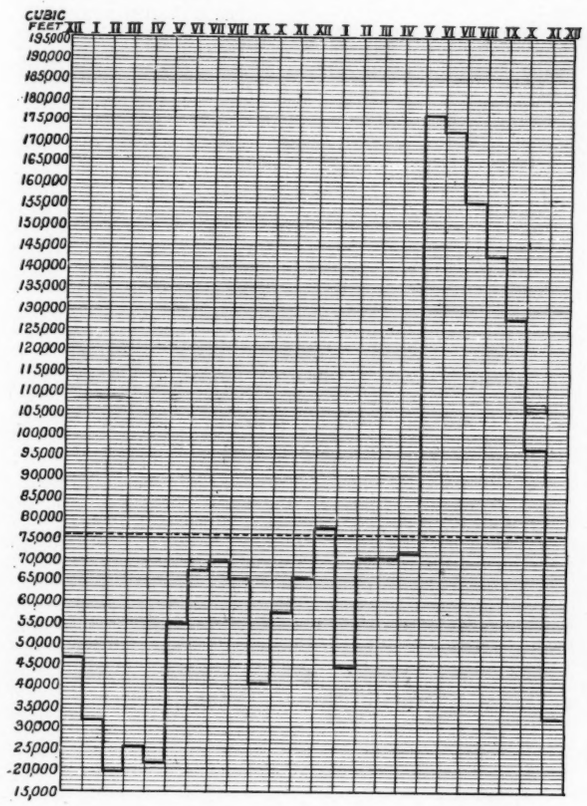
Reading Gas Company—Capital Expenditure and Gas Made.

modern form. Looking back, the primitive business, which endured for three-quarters of a century, was commonplace compared with that of the present. Through the old flat-flame burner, with all its crudity, the major part of the gas business of an undertaking was done. Then those tendrils appeared one after the other that have since side by side expanded into such considerable branches that the loss of one would alone make a substantial difference. Almost simultaneously too with the greater growth of these branches, there came to the aid of the gas industry—in the very field where competition was the keenest—the incandescent mantle. It has in truth been a greatly favoured industry; and it has now in its particular lines a predominance in domestic, in public, and in industrial uses, over either the systematized or itinerantly distributed competitors—other than coal in domestic heating.

In connection with this magnificent development, of course, several necessities arise, as has been made evident, on the one part, by the great extensions of works that have had to be carried out. But the necessity to which we wish to particularly allude on this occasion has no reference to the meeting of the demands for the staple commodity, but to the facilities that a gas undertaking should and must give to the meeting of the demands for the best means for its use. We recently wrote of the extensions at the Reading Gas-Works, made compulsory by the growth of the gas business; and, for the purposes of this article, Reading is taken as the illustration—not because the Directors and officials of the Company there are doing these things better than in other places that could be named, but because what the Reading Company, and the energetic Engineer and Manager (Mr. Douglas H. Helps) and his coadjutor, the Secretary (Mr. A. Canning Williams), have done, are doing, and propose doing, supply an excellent example of the needs of a medium-sized town and of the work and obligations that have been rendered absolutely necessary by the development in the means of consuming gas, and by the competition assailing the gas business itself. It has been said that the great expansion of the gas business and the extraordinary provision that has now to be made to supply the best of appliances for the economical use of the commodity, and to satisfy consumers' diverse and even devious fancies, have created to all intents and purposes a new department in a gas undertaking; and the question is how best this new condition may be met. Several gas undertakings—Reading among the number—have settled the question, and rightly it must be allowed, by removing the offices from the neighbourhood of the gas-works (which are not as a rule located in the brightest, most salubrious, and most central part of a town) into a position in a main street—a corner situation for preference—and combining with them a show-room. This is what has been done at Reading; and there a splendid building, comprising offices, show-room, and lecture room, has been erected, and is one of the architectural attractions of the town—thanks to the interpretation the Architect (Mr. G. W. Webb, F.R.I.B.A.) gave to the requirements of those advising him on behalf of the Company. The building was described and illustrated in our issue for June 20 last; and we have no intention of again going into any detailed account of it and its arrangement and appointments. But having taken this building and the work carried on within it as a model, it has to be shown in what way it meets the requirements.

In the first place, the town in which a gas company carry on their business has certain claims on that company; and in the work of betterment that in these times is going on in almost every

town, the gas company should take a part, when making further provision for the conduct of their prosperous business, by putting up offices and show-rooms that shall be a credit to both themselves and the town, and which shall satisfy the business demands of the present and a long distance ahead. Money spent in this way (of course, in the very small town a company cannot be expected to be greatly lavish) is not money ill-spent. There is a great power in advertisement; and headquarters of inviting exterior is a good advertisement for the owners. In this respect, the noble looking buildings the Reading Gas Company have put up in one of the main business thoroughfares of the town—with the lower part of the fabric of grey royal granite, and the upper part of red brick and stone, with a high circular angle tower, and windows of good expanse—meet with one's view exactly. Now, it is through such a building, which every day is becoming more and more a necessity, that there should flow, preferably under the supervision of the engineer and manager, the whole of the transactions between the Company and their gas consumers; and it should be a centre whereat is prosecuted the whole of the business-developing and educational work, which should be methodically undertaken by the Company. Everything possible must be done to attract attention to the building; and everything possible in the way of facility must be given to



The dotted line across the diagram—about one-third up—indicates the average consumption over 24 hours.

READING GAS COMPANY—OUTPUT OF GAS PER HOUR.

From Thursday Midnight, Nov. 3, to Friday Midnight, Nov. 4, 1904.

get the people to come inside, and get them to come again, if only for advice. The show-room must be on the ground-floor. The exhibits in the spacious windows must be frequently changed; and anyone entering the building, whatever the nature of his business, must first step directly into the show-room, which should be made comfortable and inviting to visitors, and should have the articles displayed in the best possible way for convenience of inspection and selection. Within the building, too, there should be a room large enough for popular lectures; and the Secretary's department, the rental department, and the prepayment collectors' department should all be on the ground floor, and each one should be lighted and heated in such manner that it may serve as a salutary object-lesson to all comers. These are matters that have to be considered in the design of such a building—the building, in fact, should be designed and arranged to meet its special purposes; and this is what is found has been the care of those responsible for the planning of the Reading Company's offices and show-room.

From the street, the visitor, whatever the object of his visit, steps (there is no other public entrance) first into the show-room which is carpeted and furnished with chairs and every convenience for transacting business, without the business callously staring the visitor in the face. The show-room is admirably fitted with all the latest improvements in lighting, heating, and cooking arrangements, as well as with pneumatic lighting devices, to show that the operation of a switch from one point will produce light equally as well and readily as in the case of the electric light. No one can call to see the Secretary, no one can call to pay his gas account, no one can call to lay a complaint, and no one can attend a lecture without passing through this cosily furnished show-room, with its effulgence and great assortment of artistic and serviceable fittings and appliances. The consequence is that the caller who is negligent of his gas-fittings must wonder, and is led to find out, why he does not get as good a light in his own house or business establishment as the Gas Company can obtain with the same gas in their show-rooms; and the complainer of bad gas must, before he crosses the show-room, have his belief sadly shattered that it is the Gas Company's and not his own part in the provision of light that is seriously at fault.

But there is another thing about the place of which note was made—that is the largeness of the assortment of fittings and appliances. This is a necessity that has been made the more desirable through competition. Compare the state of things now with the days when there were only available for show flat-flame burners, straight and sharp-angled fittings that were harshly repulsive to the eye, and the plainest of plain glassware. For example, there is now not only the purpose for which the light is required, which fixes also the suitable illuminating power, but there are the varied tastes of consumers to be consulted; and no single tradesman can possibly be expected to keep a collection of gas fittings and appliances such as the gas business to-day needs in encouraging development, and in meeting competition. Tradesmen who are engaged in the gas-fitting business must recognize this, if they exercise any intelligence at all in considering the matter; and we are stongly inclined to the opinion that these tradesmen should be encouraged to do their business through the Gas Company, and have the privilege of taking their customers to the Gas Company's show-room, in order that they may have the advantage of a large collection (the best and most approved fittings) to select from. Any and every business that will inure to the efficient consumption of gas should be supported through the show-room. The object of a Gas Company should not be to make a large profit on fittings, but to regard their show-room and what they are exhibiting there as a means to a definite end—as a convenience for their customers, as an effective channel for development, and as assuring that their customers, who know nothing as to gas-fittings improvements or what can be actually accomplished by them, shall have the best that can be obtained, and shall also be protected against unscrupulous dealers. The Directors of the Reading Gas Company have recognized these things, and have taken steps to cultivate the good offices of the tradesmen of the town and to offer them conveniences, as is seen by the following letter which has been addressed to them:—

Dear Sir,—As no doubt you are aware, this Company has recently opened large new show-rooms in Friar Street.

The Directors of the Company have recognized that it is not possible for all tradesmen, trading in different classes of goods, to devote sufficient space in their premises for the exhibition of the various kinds of appliances which are now used in connection with coal gas; and they have, therefore, arranged to exhibit in these show-rooms a large assortment of the latest pattern of gas-fittings, cooking and heating stoves, &c.

My Directors have instructed me to inform the Ironmongers and Gas-Fitters of this district that *a special discount of 12½ per cent.* off the prices at which the goods are marked in the show-rooms will be allowed them. They invite you to use the Company's show-rooms for the purpose of selling therefrom to any of your customers. For this purpose, any information which the Company's representatives may be able to give you will be at your disposal.

Trusting the above, if brought into practical operation, may prove of mutual advantage.—I am, &c., A. CANNING WILLIAMS, *Secretary*.

Experience elsewhere shows that, where this mutual arrangement is in vogue, it works out to mutual advantage. Only a few days ago, the representative of a large firm in the town was heard to say that, since the show-room has been opened, they have done a largely increased trade in gas-fittings. This is testimony that the show-room is creating a taste for something better than the old, and is informing the public as to the improvement that has been made in fittings, in lighting power, and in economy.

From the show-room and offices access is obtained to the well-lighted basement, with its white-glazed bricks and prism headlights. Here are to be seen the heavier types of goods; and it is the intention to have a gas-engine fitted up for purposes of exhibition and instruction. The strong room is also found here, with a lift adjacent, which travels to the top of the building, so that books, &c., can be transferred whenever required with the minimum of trouble. Returning to the show-room, the offices are entered through handsome folding doors, facing the main entrance to the show-room. The rental office with counter confronts the visitor, on the right is the Secretary's office, on the left the Assistant-Secretary's office, and at the back of the rental office is a room specially allocated to the prepayment business. About all the offices, there is an air of substantiality and prosperity; and in their fitting up there has been combined excellent taste and an eye to utility. On the first floor are found, among minor rooms, the Board-room (in which are hung the portraits of present and past Directors and chief officials, prominent among them being the octogenarian Chairman, Mr. J. Okey Taylor, J.P., with behind him a half-century's service as Director, during all

but three years of which he has been head of the Board), the Auditor's room, and a lecture-room capable of accommodating some 110 persons. This last-named room will be used for propagating knowledge concerning gas and its manifold uses; and there the public of Reading will be taught that gas can be profitably used and unprofitably abused. The opening lecture in the room will be delivered by Mr. J. W. Helps, of Croydon; and it is hoped that the audience on this and other occasions will contain a representative number of the medical gentlemen and architects practising in the town. The Company want to spread abroad the truth about gas; and they are anxious to secure the attachment of those who carry influence with the general public. With this in view, and as a first step towards enlisting sympathy in the educational work they have taken in hand, the Directors have caused the following letters to be respectively addressed to the local members of the medical and architectural professions:—

Dear Sir,—I beg to inform you that this Company have recently opened large show-rooms at their Central Establishment in Friar Street, where may be seen specimens of the latest and most approved appliances for gas lighting, cooking, heating, &c.

As a member of the Medical Profession, you are doubtless interested from a hygienic point of view in matters relating to lighting, cooking, and heating; and my Directors have therefore desired me to specially invite you to inspect the varied stock on view.

Any information on these subjects which the Company's representatives may be able to give will be at your disposal.

Trusting to be favoured with a visit of inspection.—I am, &c.,
A. Canning Williams, *Secretary*.

Dear Sir,—I beg to inform you that this Company have recently opened large show-rooms at their Central Establishment in Friar Street, where may be seen specimens of the latest and most approved appliances for gas lighting, cooking, heating, &c.

As an Architect, you are doubtless interested in matters relating to lighting, cooking, and heating; and my Directors have therefore desired me to specially invite you to inspect the varied stock on view.

Any information on these subjects which the Company's representatives may be able to give will be at your disposal.

Trusting to be favoured with a visit of inspection.—I am, &c.,
A. Canning Williams, *Secretary*.

We need not ascend further into the building. Several of the upper rooms are placed at the service of the caretaker; others the Company have at disposal for use as occasion requires.

From what has been written, it will have been seen that these central offices and show-rooms at Reading, which have been used here as an illustration, are now, and they are going to be still more so in the future, the hub of great activity in business promotion and usefulness to those with whom business is done. Without them, so much effective work could not possibly be undertaken or accomplished, nor could so much facility be given in place other than the centre of the town for the conduct of business with the consumers and for inducing them to bring themselves into closer relationship with the Company. In every town claiming any degree of importance, it is easy to make out a good case for centralized offices and show-rooms. They are a necessity that has issued from a combination of circumstances, but principally from the development of the gas business, from the growth from few to innumerable forms of gas fittings and appliances, and from the keenness of competition. In connection with the provision of the necessity, remember the value of making a good impression.

Exhibitions and Exhibition Funds.

The result of the very business-like financial arrangement under which the Electrical Exhibition at Olympia was conducted was referred to last week (p. 673). Further information was given by Mr. E. Cunliffe Owen, Chairman of the Exhibition Executive Committee, at the annual dinner of the Institution of Electrical Engineers last Friday. He stated that the success of the exhibition had enabled them to return to the exhibitors 25 per cent. of the amount which they paid for the sites of their stands—viz., about £2000. A nice little nest-egg would still remain. It was promised that, if there was a surplus on the show, it shouldgo to benevolent objects. It was therefore intended to give a certain proportion to the Benevolent Fund of the Manufacturers' Association, and also to make a grant to the Benevolent Fund of the Institution of Electrical Engineers, which he was authorized by his Executive Committee to say would amount to £250.

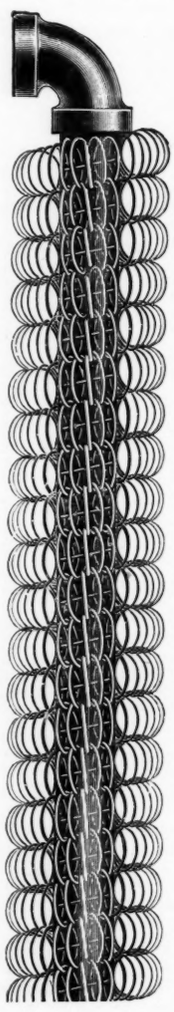
The Gas Question in Paris.—Another step has been taken in connection with this important question. In the "Journal" for the 21st ult., we recorded the passing by the Chamber of Deputies of a Bill sanctioning direct municipal control of the gas supply from the beginning of next year; but, of course, their action has to be confirmed by the Senate, who, it may be remembered, rejected the previous Bill containing a similar proposal. Last Wednesday, at the close of the debate on the Separation Bill, which has lately occupied the whole of the time at the disposal of the Upper House, M. Prevet presented a report from the Committee who had had the Gas Bill under consideration. At a meeting prior to the sitting of the Senate, the new Minister of the Interior (M. Dubief) had an interview with the Committee, in the course of which he urged upon them the advisability of accepting the principle of direct control adopted by the Chamber. The Committee were so little impressed by his remarks that they decided, by five votes to two, to recommend the rejection of the Bill.

A NEW GAS CALORIMETER.

Devised by Professor C. V. Boys, F.R.S.

The London Gas Act of this year throws upon the Metropolitan Gas Referees several new duties, among which is that of prescribing a mode of testing the calorific power of the gas supplied by the three Metropolitan Gas Companies. The provisions of the new Act come into force with the New Year; and the question of testing calorific power must therefore have been claiming the attention of the Gas Referees since the passing of the Act. It becomes a matter of some significance in this connection, therefore, that a paper was presented at the meeting of the Royal Society on Thursday last, on a "Gas Calorimeter," by Professor C. V. Boys, who is one of the Gas Referees. Unfortunately for immediate publicity, however, the paper was taken as read; and a full report of its contents will not be available, under the Society's rules, until it has been printed in their "Proceedings." In the meantime, however, we understand that the essential features of the calorimeter are as follows.

It has been designed with the object of providing ample space for the circulation of the stream of gases, so that they pass at a gentle rate of flow through the instrument, and are thus effectively exposed to the cooling surfaces. The water content of the instrument has on the other hand, been reduced to the smallest quantity; so that the outflowing water attains its ultimate temperature very quickly after the gas is lighted. The whole of the circulating water takes continuously the same course—being debarred from any parallel or alternative routes; and thus unequal heating of it, and the attendant irregularity of the temperature at the outflow, are avoided. The small content of water becomes adequate to abstract the whole of the heat from the slowly travelling stream of gases, owing partly to the avoidance of parallel routes, but mainly by reason of its flow through pipe of small diameter, the heat-collecting power of which is greatly increased by attached ribs or wires.



The manner in which the principles referred to are embodied in the instrument will be apparent from the following particulars of its construction. The gas is burnt, conveniently at the rate of 4 to 5 cubic feet per hour, in two small union-jet burners, which enter the short metal chimney of the apparatus. The upflowing gases strike the bottom of an equalizing chamber, in which special provision is made for equalizing the temperature of the contained water, which passes thence directly to the water outlet of the apparatus, where its temperature is measured. The gases are then deflected downwards through an annular space in which are a number of coils of pipe, to which is sweated a helix of copper wire wound round it according to the method employed by Mr. T. Clarkson, of Chelmsford, for the pipe now so generally used in motor-car radiators. The annexed figure shows a portion of the Clarkson radiator-tube. The gases then pass upwards through an outer annular space, through which similarly the pipe takes several turns, and at the top pass into the open. The circulating water passes from an inlet box, where its temperature is measured, into the uppermost turn of the pipe in the outer annular space, and thence flows through the coils in a regular stream to the equalizing box and outlet already mentioned.

The thermometers for measuring the temperature of the inflowing and outflowing water, and of the escaping gases, are all virtually at the same level, which presents a great advantage in making the readings. The apparatus has a height of about 1 foot, so that the thermometers are at a convenient level for reading when it stands on an ordinary table. Provision is made for collecting and measuring the water resulting from the combustion of the gas. The apparatus is set up in three parts, either of which may be turned about a common vertical axis to any position relatively to the others. Thus it is quite immaterial how the gas-supply pipe, water-supply pipe, water waste, and condensed-water receiver are situated with regard to one another; the tubulures on the apparatus for each purpose can be turned in any direction. In this and many other respects the convenience of the observer has been specially considered. The apparatus may be at once dismounted after use, and the acid products, which are usually left within gas calorimeters, washed out or neutralized.

The experimental calorimeter was made for Professor Boys by Messrs. J. J. Griffin and Sons, of Sardinia Street, W.C.

CYLINDRICAL SETTINGS FOR GAS PRODUCTION.

By W. Bäcker, of Budweis, Bohemia.

The construction of this setting (see *ante*, pp. 678-9) has, it seems, become a matter of interest. Allow me, therefore, to give some further particulars for publication about the construction and working of my vertical retorts in cylindrical settings.

The cylindrical setting has been preferred because it is by far superior to the angular one with respect to working. Its circumference is smaller, and the loss of heat is therefore less, by which, in connection with the central firing, a considerable economy of fuel is obtained. The accessibility of the retorts, as well as their isolation and connection, is possible without interruption of the working. But it is in relation to hygiene that cylindrical settings chiefly deserve to be mentioned. By the establishment of the cylindrical setting there is everywhere plenty of light and air; and cleanliness also is worthy of notice. In the store, the coal is filled into iron funnels, and is carried directly on overhead rails till it is above the retort to be charged. In this manner, the very disagreeable and injurious formation of dust and soot is almost completely avoided.

As single retorts and furnaces can be isolated, it is not necessary to heat all divisions of the setting, but only the retorts required. Every second retort has a partition wall, which shuts off completely the portion of the setting concerned, when the fire and air holes connected therewith are closed, which can be very easily brought about. When using only a part of the setting, overheating of, or damage to, the shut-down retorts is impossible; but in any case these retorts could be joined by a short piece of iron pipe with the secondary air channel, and then they would serve as regenerators, and the loss of heat would be very limited. The small shutting-off walls between each retort are placed so that the heat, when required, is forced to be always in circulation below or above the retorts. As the tar remains thin and liquid, only a small dip-pipe for each retort is quite sufficient. Large hydraulic mains and long ascension-pipes are consequently entirely superfluous. This is a feature which will be for the welfare of all the workmen.

Herr Bäcker has also forwarded a copy of the provisional specification of his English patent; and the portions reproduced below, read in conjunction with his article and the drawings and particulars published last Tuesday (pp. 678-9), will serve to explain the invention. The patent is described as referring to "Improvements relating to Gas-Generating Furnaces."

Herr Bäcker states that the invention has for its object a gas-generating furnace with retorts arranged in a closed figure (in a circle, for example), and in which one or more grates or fireplaces of any approximate kind are arranged preferably centrally thereof; the arrangement or construction of the furnace being such that any desired number of retorts or furnace divisions or grates may be put out of action. An arrangement of this kind, he claims, presents the advantage, as compared with known forms of gas-generating furnaces, that the loss of heat by radiation is much reduced, as the hot gases flow over the outer annular wall in a cooled condition; and in proportion to the number of retorts this closed form presents the smallest radiation surface.

The annular gas-furnace consists of the furnace installation arranged around the central chimney, and preferably composed of a number of grates adapted to be charged separately, and of the desired number of vertical retorts of any appropriate cross section built in an annular chamber; the diameter of the furnace being determined by the number of the retorts. The annular chamber communicates, by means of appropriately arranged flues, with the shaft or pit furnaces, and also with the chimney. In one arrangement of the invention, the furnace-flues lead to an annular combustion chamber, which is connected with the separate divisions of the annular retort chamber by means of flues, the number of which is determined by the number of the divisions or by the manner in which it is desired to conduct the heating gases away. In order that the heated gases may uniformly flow over all the parts of each retort, in addition to the partitions forming the divisions, further partitions or baffles are provided for guiding the heated gases, so that the gases flow upwards and downwards in a zig-zag path through the compartments of the annular chamber, uniformly heating the retorts, and then flowing through flues back into a common annular passage—the passage being connected by flues with the chimney, through which the gases finally escape.

Herr Bäcker, however, points out that in pit or shaft furnaces the grate-area is small as compared with the fuel, so that the air required for the complete combustion of the heating gases is unable to enter; and therefore, for the purpose of better utilizing the calorific power of the fuel, provision is made for an auxiliary draught of what is termed secondary air in the annular furnace. To this end, the separate compartments of the annular chamber in the above arrangement communicate with the outer air through flues; the arrangement of these flues being such that they run in a zig-zag fashion in the masonry of the furnace, for the purpose of preliminarily heating the air, and open centrally outwards. The secondary air supply may, however, be effected in various ways, in accordance with the circumstances of the installation. The annular chamber is likewise provided with cleaning-holes, permitting of cleaning the heating-gas flues and air-flues.

As the annular retort chamber extends beyond the furnace installation, says Herr Bäcker, the projection is supported by suitably-arranged columns or pillars; care being taken to provide for free access to the retorts and furnace grates or fire-places which are arranged to be emptied below. The separate furnaces or grates are adapted to be shut off relatively to the annular chamber by means of a slide, which arrangement permits of effecting repairs to the several fire-places without interrupting the operation of the entire plant. In a similar manner, in order to effect repairs or replacements, any desired number of retorts may be put out of action by closing the respective heating gas and air flues, or by the construction of the partition walls. This latter operation is best effected by the use of the already mentioned cleaning-holes through which access is obtained.

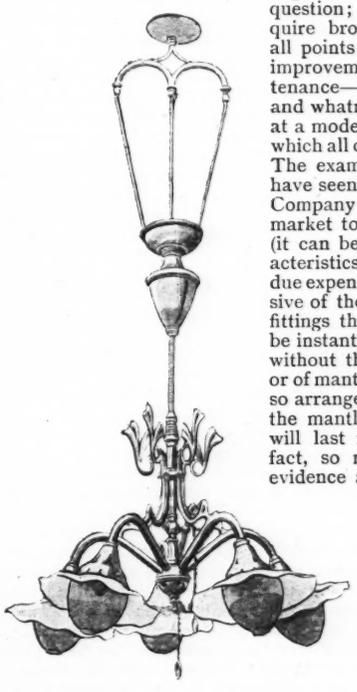
Herr Bäcker remarks that it is also permissible, in order to obtain better isolation of the separate compartments which are to be rendered inoperative, to fill the corresponding retorts with insulating material, such as ash or coke. The retorts built in the annular chamber are preferably made of "Chamotte;" and they may be of any convenient cross section. The upper head of the retorts, which is connected with a hydraulic main in the usual manner, serves for charging the retorts; and they may be readily emptied from below, owing to a freely accessible cover being provided. The ash-pit under the grate is preferably filled with water; while the lower part of the chimney serves for the reception of the dust and soot, and is adapted to be emptied as desired.

The inventor concludes by saying that a furnace arranged as described may be readily operated; and owing to its compactness it occupies but little space. Further, in consequence of the fact that the heating gases are utilized in all directions, the efficiency of the plant is largely increased.

NOVEL & ARTISTIC GAS FITTINGS & LIGHTS.

The ingenuity of Mr. George Helps has in many ways developed much that is not only of interest but valuable to the gas industry; and, as is well known, business in many of the productions of his skill has been undertaken by the Nuneaton Gas Company. In these days of keen competition, we want all the fruits of the energy of men of inventive bent who can give us new and striking and artistic forms of fittings, and fittings that shall give a high duty and require the minimum of attention on the part of consumers or of those who undertake the work of maintenance. These are the varied directions in which Mr. Helps has successfully sought to improve, and in the articles produced to combine the improvements.

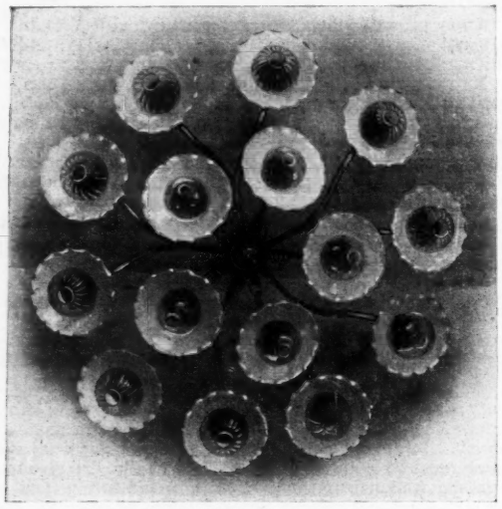
There is no doubt, in connection with gas lighting, as to the importance of the maintenance question; and it does indeed require broad consideration, from all points of view. Therefore all improvement that enables maintenance—of the burners, glass, and whatnot—to be persevered in at a moderate cost is something to which all can give hearty welcome. The examples of the fittings we have seen that the Nuneaton Gas Company have placed on the market to compass this end, have (it can be asserted) all the characteristics necessary to avoid undue expenditure on lighting, exclusive of the cost of the gas. The fittings the Company supply can be instantly adjusted and cleaned without the removal of any glass or of mantles; and the burners are so arranged on flexible tubes that the mantles, with ordinary care, will last for several months—in fact, so many months that the evidence afforded effectually dissipates the "bluff" of the electricians as to incandescent mantles depreciating in illuminating power. These fittings are made for two, three, four, five, six, ten, or fifteen light clusters; and for use in churches, halls, or other public buildings, they may be attached to a very simple and decorative, and at the same time reliable, form of rising and falling pendant, called the "Ilive." The above illustration of the pendant is self-descriptive. But the



The "Ilive" Pendant.

important point may be noted that with this arrangement, to give attention to the lights, no chairs, steps, or ladders are necessary, as everything requisite can be done from the ground. The advantages of such a pendant are obvious in respect of the facility it affords to all concerned in giving the lights attention, or in their upkeep in good condition at a moderate price. The saving in labour is great, compared with that required where fittings are fixed and steps or ladders are needed for the work of cleaning, &c. The various styles in which the fittings are being made are suitable for any situation from palace to cottage, or from church to workshop. They are also constructed with a tap and a movable nipple to each arm. One of the nipple plugs can be arranged to supply ten burners or even more; and it is instantly removable.

The second illustration is an underview of an extremely pretty and novel fifteen-light fitting, which very much takes the fancy; and in any large room will make a remarkably handsome centre-piece. This fitting is about 3 feet in diameter. The number of lights in use can be varied to circumstances. When the whole of the lights are not required, the ten outer lamps can be used alone; or if less light still will suffice, only the five inner ones. Further



Under View of the Fifteen-Light Cluster.

variety can be obtained by having separate tubes to each burner, or to any series. Each burner takes a bijou mantle. The shade and globe may be secured to the holder with screws in the ordinary way; or, as an alternative, there will shortly be a new device (called a draught screen) which will obviate the use of screws. The consumption of gas by each burner can be regulated to 1 cubic foot per hour, which, with 16-candle gas, will give an efficiency of something like 30 candles. The holders for these fittings are made to suit either the ordinary bijou glass on the market or special glass—plain or ornamental.

These are specimen specialities of the Nuneaton Gas Company; and such successful attempts as they have (through their Engineer and Manager, Mr. George Helps) made to widen the effective means at the command of the industry to meet the public taste and abet efficiency in gas-lighting, certainly deserve the greatest commendation.

The "Ilive" pendant described above is also being put on the market by Messrs. Falk, Stadelmann, and Co., Limited, under the style of the "Central" counterbalance pendant. It is seen from the illustration already given that the movement is concentric, and that the fitting is equally applicable to cluster lights as to silk-shade fittings. The firm have now in preparation a range of three-light clusters for use in conjunction with the new pendant, which, it may be added, combines the economy of incandescent gas with the adjustable features of an electric counterweight pendant—the flexible metallic tubing employed in its construction being made of special strength suitable for the purpose.

Messrs. A. E. Podmore and Co. are introducing a reversible globe, the one half of which is of clear glass and the other half of opal. For several purposes this reversibility will be found useful, and will, in large establishments—such as schools, factories, and business places—obviate the necessity for keeping an unnecessary variety of glassware in stock for meeting the different requirements of special situations. For example, the globe can be used with the opal part at the bottom, so as to shield the eyes from the intensity of the light. With the globe employed in this manner, the light is soft, and prevents any harmful influence on the eyes. On the other hand, if a strong downward light is needed, the clear glass part can be at the bottom; the opal half at the top serving as a reflector.

PERSONAL.

Mr. R. Nelson, of the Whessoe Foundry Company, Limited, of Darlington, has been appointed Draughtsman and Chemist to the Sutton, Southcoates, and Drypool Gas Company.

Mr. C. H. Webb, now Assistant-Engineer at the Stockport Gas-Works, has been appointed to succeed Mr. W. North as Gas Engineer and Manager to the Stourbridge Urban District Council. Mr. Webb will take up his new duties on March 1 next; while Mr. North will, as already stated in the "Journal," retire on the 31st of the same month—much to the regret of the Council.

Among the gentlemen elected on Tuesday last as Associate Members of the Institution of Civil Engineers was Mr. Samuel Cutler, jun., in which class his father's name has appeared now for over thirty years. The new associate member has not confined himself to the work of the engineering firm with which he is intimately identified, but has taken a considerable share and interest in associated technical work. For two years he was the Chairman of the Junior Institution of Engineers, and had the honour of occupying that position during the year of the "coming-of-age" celebrations. The Junior Institution has come very much to the front lately; and the strength of the body, and the excellent work done by the members, have commended the organization to the leaders of science, engineering, and the legal profession. Mr. Cutler resigned the chairmanship with the Institution in a very strong position. He has also contributed papers to various engineering societies; and they have shown that, in an engineer circumstanced as Mr. Cutler is, it is possible for scientific and commercial interests in engineering to be absolutely dissociated as occasion and propriety demand. We congratulate him upon his election.

OBITUARY.

The death is announced of Mr. W. M'Landsborough, who was for many years Water Engineer, first to the Cheltenham Water Company, and later to the Corporation, who shortly after the incorporation of the borough became the owners of the water-works. The deceased was 76 years of age.

The death of Herr A. Hoffmann, Manager of the gas-works at Kaiserslautern, is announced to have taken place on the 4th ult. Deceased had held his appointment since the erection of the first gas-works in that town in 1857, and had taken a very active part in the proceedings of the district technical association. He had attained his 71st year.

The death occurred last Wednesday at the advanced age of 82, of Mr. Maurice Brooks, the founder of the firm of Messrs. Brooks, Phillips, and Co., of London, and founder and Chairman of Messrs. Brooks, Thomas, and Co., of Dublin. Thirty years ago deceased was an active member of the Corporation. He was chosen for the office of Lord Mayor in 1874, and in the same year he was elected a member of Parliament for Dublin. He sat in Parliament till 1885, and took a considerable part in the Liberal politics of the day. He was one of the Directors of the Alliance and Dublin Gas Company, a Deputy-Lieutenant, and a Justice of the Peace for the county of Dublin.

A Visit to the Voelker Mantle Works.

By the courtesy of the Directors of the Company, a highly instructive visit was paid last Thursday afternoon by the Association of Engineers-in-Charge to the Voelker incandescent mantle factory at South Street, Wandsworth. Between thirty and forty members were able to take advantage of this opportunity, which had been secured for them by the Hon. Secretary (Mr. Henry Capsey), to see how mantles are made; and on their arrival they were divided up into two parties—Dr. Schoder taking charge of one, and Mr. Mason of the other. Both these gentlemen proved excellent guides; being untiring in their efforts to fully explain the nature and object of the various processes carried on. The works have already been described at length in the pages of the "Journal;" and it is therefore unnecessary to give any particulars here. Suffice it to say that the visitors were enabled to follow the mantles through every stage in their manufacture—concluding their inspection at the well-fitted up laboratory attached to the works. It may be mentioned that the services of 400 hands are required, to ensure a daily output of 30,000 mantles; and the visit of the Association took place, of course, during the busiest season of the Company. At the close of the inspection, a hearty vote of thanks was accorded—on the proposal of Mr. T. Aldworth, the Chairman of the Association, seconded by Mr. J. S. Ardley—to Dr. Schoder and Mr. Mason for the great kindness they had shown the members during the afternoon. In briefly replying, Dr. Schoder said he had been very glad to do what he had; and he hoped the Association had gained some knowledge which would be of use to them. In the evening some of the members went to see the Aldwych and Kingsway intensified gas installation. Both these visits were particularly well timed, inasmuch as to-morrow night the Association are to have read to them, by Mr. J. W. Blakey, a paper on "High-Pressure Gas Illumination."

ESTIMATION OF NAPHTHALENE IN COAL GAS.

An Original Method.

At the Meeting of the London Section of the Society of Chemical Industry, at Burlington House, on Monday last week—the CHAIRMAN (Mr. A. Gordon Salamon) presiding—Mr. C. J. DICKENSON GAIR, of the Vauxhall Works of the South Metropolitan Gas Company, read a paper on the above subject.

The author commenced by remarking that, at first sight, the estimation of naphthalene, either in pure or impure coal gas, did not appear to be beset with any great difficulty. The well-known fact that the vapour of naphthalene precipitated naphthalene picrate when passed through a strong solution of picric acid was, he proceeded to remark, apparently all that was necessary on which to base a method of estimation. But it was found impossible to estimate naphthalene in coal gas by merely passing a measured quantity of the gas through a picric acid solution, and then weighing the precipitate so formed as naphthalene picrate, because, in the first place, all the naphthalene would not combine with the picric acid, but some of it condensed out in the free state. In the second place, a quantity of naphthalene invariably condensed in the delivery-pipe and connections of the apparatus, and, furthermore, with coal gas containing quantities of ammonia, the picric acid was neutralized to some extent—ammonium picrate being formed, which, of course, quite destroyed any degree of accuracy. Thus it would be seen that a naphthalene estimate must always be accompanied with precautions which made it by no means a simple matter.

Continuing, he referred to the method of estimation devised by Dr. Colman and Mr. Smith, and gave a short sketch of a slight modification of the original, which had been fonnd very simple and rapid of execution. The gas to be tested was passed through three Woulff's bottles, containing exactly 500 c.c. of $\frac{N}{20}$ picric acid solution, and then through an experimental gas-meter. After a convenient number of cubic feet of gas had passed, the test was shut off, and the contents of the Woulff's bottles were mixed together in a 20-oz. flask, and carefully heated on a water-bath to a temperature of about 60° C., until the precipitate of naphthalene and naphthalene picrate had entirely dissolved. Naphthalene picrate was easily decomposed by excessive heat; and to guard against loss from this cause, the flask was always fitted with a cork through which a glass tube dipped into a beaker containing a small quantity of picric acid from the Woulff's bottles. After the experiment, the picric acid in the beaker was poured back into the flask, the contents of which were then cooled. Crystalline masses of naphthalene picrate separated out; and when quite cold the precipitate was filtered off, dried in vacuo, and weighed. From the weight of picrate thus found, the amount of naphthalene per 100 cubic feet of gas could be easily calculated.

The author next explained the volumetric method of estimation in vogue. An aliquot part of the clear residual picric acid solution was taken, Lacmoid indicator added, and the whole titrated with $\frac{N}{10}$ sodium hydrate solution. The difference between the result thus found and the quantity of picric acid in the original solution represented the amount of picric acid which had combined with the naphthalene; and as 229 parts of the former combined with 128 parts of the latter, the amount of naphthalene in the gas was easily calculated. To guard against loss of naphthalene by condensation in the pipe leading to the apparatus, it was well, he said, to have a connection as near the main as possible, and surround it by a steam-jacket. The author said he had found this an immense advantage in all methods of estimation.

Mentioning that the test devised by Dr. Colman and Mr. Smith was for pure or nearly pure coal gas, the author said it could be made to give gravimetric results with impure coal gas if the ammonia were removed. This was effected by means of oxalic acid solution, maintained at a temperature of about 80° C. All that was necessary was to introduce a Woulff's bottle containing the hot liquid in front of the bottles that contained the picric acid solution.

The next method noticed was one devised by Mr. Somerville, of the Bankside works of the South Metropolitan Gas Company. It differed entirely in principle, said the author, from that of Dr. Colman and Mr. Smith. Three glass tubes, about 7 inches long and 1 inch wide, were fitted up in a similar manner to Woulff's bottles, and about 35 c.c. of 70 per cent. alcohol were poured into each. The three bottles were closely connected. A measured quantity of gas was passed through; and the test was disconnected. The contents of the tubes were then intimately mixed in a flask. If the gas used was impure, it would be necessary to add strong oxalic acid solution until the ammonia was entirely neutralized, as shown by litmus paper. The contents of the flask were filtered, and the filter-paper washed with dilute alcohol. Concentrated picric acid was added in large excess (about 500 c.c. being generally necessary). The liquid was agitated, and allowed to stand for about half-an-hour. By this time, all the naphthalene picrate would have separated out, and might be filtered, dried *in vacuo*, and weighed. This method had been found to be a very quick one, both for pure and impure gases. The advantage of the method was that the naphthalene picrate was readily obtained without the risk of loss of weight. The liquid filtered somewhat slowly, however; and, owing to the finely divided state of part of the precipitate, it was often necessary to pour back the first part of the filtrate several times till it became quite clear.

The author next gave particulars of a separate and distinct method for the gravimetric estimation of naphthalene which he had himself devised. It was founded on the action of a suitable solvent. Remarking that the solvents for naphthalene which were applicable for its estimation were few and far between, he said that in this case use was made of acetic acid of a specific gravity of 1·044. About 350 c.c. were taken in Woulff's bottles or towers, and a measured volume of gas (not more than from 3 to 6 cubic feet usually) was passed through, at the rate of about 1 cubic foot per hour. If the gas was impure, use was made of the hot oxalic acid solution previously mentioned, as a catch. A small Woulff's bottle containing picric acid solution was also added. In the event of there not being sufficient pressure to force the gas through the wash-bottles, or if the gas were under vacuum itself, use was made of a piece of apparatus which pulled the gas through the bottles by means of a water-pump, after which the gas was automatically separated from the water and passed through the experimental meter at ordinary atmospheric pressure. After the experiment was finished, the acetic acid from the bottles was mixed in a flask, and about 500 c.c. of concentrated picric solution, in all, was added. Pure naphthalene picrate separated out at once, in large flocculent masses, which had the advantage of being extremely easy to filter. After filtering, the naphthalene picrate was dried *in vacuo* in a warm room, and weighed. The method was proved to be correct by these means: A small corked bottle or U tube was taken, having inlet and outlet tubes. A quantity of pure dry naphthalene crystals was inserted in the bottle, and the whole weighed. The bottle was then connected up to a supply of coal gas from which every trace of naphthalene had been removed. The Woulff's bottles containing acetic acid and the one containing picric acid were connected, the experiment started, and allowed to proceed for some time. The gas was then shut off, the bottle stoppered and placed in a desiccator for a few minutes, and again weighed—the difference in the two weighings being the quantity of naphthalene passed into the bottles. The same process of precipitation, &c., was gone through as previously described; care being taken that any naphthalene crystals that might have been condensed in the colder parts of the apparatus were first dissolved in a small quantity of alcohol, and then added to the acetic acid. The amount of naphthalene found by calculation was then compared with the quantity found by actual weighing.

The results of the experiments were as follows: Amount of naphthalene found by weighing, 0·500 grain; by experiment, 0·470 grain. Another experiment came out at 0·800 grain by weighing; 0·778 grain by experiment. Using air as the naphthalene conveying agent, the weight of naphthalene passed was 0·500 grain; and weight found by experiment, 0·491 grain. Another experiment came out at 0·550 grain and 0·537 grain respectively. In a further case the results were 0·400 grain and 0·394 grain respectively—the average error being 1·5 per cent. This showed that the method was sufficiently accurate for all technical purposes.

Several experiments, the author added, were made with coal gas against Dr. Colman and Mr. Smith's method; and he gave a few examples. By the acetic acid method with pure gas, one gave 39·4 grains of naphthalene per 100 cubic feet; and by the picric acid method, 38·4 grains. In another case, the respective figures were 31·3 and 32 grains. With impure gas, the figures came out very nearly as good. One experiment gave 33·1 grains with the acetic acid method, and 36·7 grains with the picric acid method. A second one gave in the two cases 35·8 grains. It was mentioned that in no experiment was any length of rubber tubing left exposed to the gas, because of its power to absorb large quantities of naphthalene.

In concluding, the author remarked that the reason for adding such large excesses of picric acid in the alcohol and acetic acid tests was because naphthalene picrate itself was quite soluble in both alcohol and acetic acid. All the apparatus for the acetic acid test was manufactured by Messrs. Alex. Wright and Co., Ltd.

Discussion.

Dr. H. G. COLMAN (London) remarked that he wished, in the first place, to thank Mr. Dickenson Gair for his interesting paper; and for the addition he had made to their knowledge of the methods of testing for what was to gas engineers a very troublesome impurity. The author had shown how, by the use of acetic acid, he was able to obviate the chief difficulty Mr. Smith and himself had experienced in the test they had devised. What they discovered was that, when gas was passed through an aqueous solution of picric acid, the whole of the naphthalene was removed from the gas, and came down partly in combination with the picric acid, and partly as free naphthalene. What they were afraid of, when first using the test, was that the other vapours of the gas—like xylene—which formed unstable picrates, would also come down. But, as a matter of fact, they were not formed in aqueous solution, but were then wholly dissociated; whereas naphthalene picrate was only dissociated partially. To get over this difficulty—to convert the precipitated naphthalene wholly into picrate—they were obliged to adopt the method which had been previously employed by Küster

for estimating naphthalene in mixtures of that hydrocarbon with other constituents like naphthols—that was, heating the liquid containing naphthalene and the picric acid until the whole was dissolved; and then, on slowly cooling, the naphthalene crystallized out completely as picrate. Mr. Dickenson Gair had shown that in the presence of dilute acetic acid the naphthalene was at once wholly converted into picrate. The picrate thus formed could be directly filtered off and weighed. In this way, he was able to avoid the somewhat tedious method of heating which was perhaps more objectionable for the length of time it took than for any other reason, though, of course, it also introduced another possible source of error. However, it appeared to him (Dr. Colman) to be rather a disadvantage to have a gravimetric method as the only option; and he distinctly preferred to have a volumetric one if he could get one of sufficient accuracy. This was particularly the case where one had to make tests in different parts of the country and in small works where perhaps no balance existed. One could easily carry a sufficient amount of standard solution to enable one to work the test anywhere. Mr. Dickenson Gair some weeks previously kindly told him (Dr. Colman) of the contents of his paper, and of the results he had realized; and on thinking it over, it seemed to him that there was the possibility that, perhaps by combining the two methods, a volumetric process might be obtained in which the heating stage could be avoided. As naphthalene picrate formed without dissociation in dilute acetic acid solution, it seemed possible that, by adding some acetic acid to the standard picric acid solution used in the method proposed by Mr. Smith and himself, the naphthalene, instead of coming down as a mixture of free naphthalene with picrate, might all come down at once as picrate. He had made some experiments on this line; and while it was a little too early yet to say definitely how the method would work, the results so far obtained indicated that there was a very reasonable possibility of a satisfactory volumetric test being thus secured. So that there would then be Mr. Dickenson Gair's gravimetric method, and also—by the combination of Mr. Gair's method with that by Mr. Smith and himself—a volumetric method, either of which might be used. As to the employment of alcohol, suggested by Mr. Somerville, he (Dr. Colman) had himself been experimenting in this direction, and had found that, unfortunately, in the presence of the former, a small amount of xylene and other hydrocarbons was precipitated as picrate along with the naphthalene, and therefore gave too high results. The picrate produced had the same appearance as naphthalene picrate; but whereas pure naphthalene picrate had a melting point of 149° C., he had got with alcohol a mixed picrate melting at about 90° C., and which, on heating with caustic soda, gave off a mixture of naphthalene with other hydrocarbons.

Mr. J. Hewett (London) said with regard to Mr. Gair's experiments with acetic acid solution, he should like to congratulate him on having devised this method. He could entirely bear out his statement with respect to its utility, having tried it himself for the last four or five months. The acetic acid he generally used had been of a strength of about 70 per cent. He had also tried the alcohol method mentioned by Dr. Colman, and had found that he did not get that cloudy precipitate—due he took it to the xylenes—in such quantity with the acetic acid method. If they got any at all, it cleared off, and they were able to filter the solution much quicker; and the experiment was generally much less troublesome. He had been making several experiments, and had used this method with dilute acetic acid for some months, for the estimation of naphthalene in coal gas—not only in pure coal gas, but also in impure. If useful for anyone to know it, he might add that he had also tried it to extract naphthalene from such things as turpentine, petroleum, paraffin oils, and so forth. Supposing they dissolved naphthalene in turpentine or other of the mentioned oils, and mixed the oil with the acetic acid, they went into a homogeneous solution, and, on adding picric acid solution to the mixture, they got the crystals of naphthalene picrate formed, and in most cases the oil did not separate out and float to the surface. They were then able to filter off the naphthalene picrate, and the results he believed were fairly accurate.

Mr. W. J. A. Butterfield (London) said he had had experience of various modifications of Küster's method of estimating naphthalene as elaborated by Messrs. Colman and Smith; and, working with gas at ordinary temperatures, he thought that the method left little to be desired. When one came to work on crude coal gas, however, at a temperature of (say) 80° Fahr., the maintenance of the temperature of the connection by a steam-coil and the maintenance of a solution for the removal of ammonia for several hours at a high temperature, as referred to by the arthor, were matters of some difficulty; and in this respect he thought that the picric acid methods, as a whole, failed. He could not speak from experience of the method of Mr. Somerville with alcohol; but it seemed to him to be more promising. But for working on crude coal gas at a temperature well over 100° Fahr., for instance, he thought some method of absorption by an oil—not a coal-tar product—which contained no naphthalene, and the subsequent recovery of the naphthalene absorbed by fractional distillation, though rough, was likely to give more satisfactory results than the apparently more scientific methods of estimating by means of picric acid. The difficulty of maintaining a stream of gas from the works' plant—condenser, or what not—which was at a high temperature, through a train of connections to the picric acid tubes or the acetic acid tubes for several hours, without allowing it to cool before it reached the latter, was very great, and could scarcely be managed in several positions on the works. It was unnecessary, when using oil as an absorbent of naphthalene, to effect the prior removal of ammonia; and thus the train of connections was considerably shortened. He had found that very satisfactory estimations might be made by means of oil of suitable grade; but, speaking generally, it must not be a coal-tar product. For ordinary temperatures, he wished for nothing better than the Küster-Colman test.

Dr. Colman agreed that the Smith-Colman test was only applicable to gas at ordinary temperatures. At high temperatures, it did not work at all. It had never been claimed to do so.

Mr. Dickenson Gair, in the course of his reply, said with regard to Dr. Colman's contention with reference to the gravimetric and volumetric methods, it was really only a matter of taste; but where there was any difficulty about the balance, it was a very simple matter, if one was out on a district, to collect samples, and take them home and test them in the ordinary manner. There was no great difficulty in that. His own experiments, he might say, were made over a year ago. Mr. Butterfield spoke of hot coal gas. He (Mr. Dickenson Gair) might say that the acetic acid method was most beautifully applicable to hot coal gas, because the warmer the acetic acid got, the more absorbent was it of naphthalene; and if they used more bottles—say three or four altogether—and a slightly greater quantity of acetic acid, they could work so that the end bottle gave off no naphthalene at all, being cold. They could not want a better method. As to the fractionating method, he did not think there was any advantage in it over the other method, inasmuch as it was quite as likely to get blocked up as the acetic acid test, and was very cumbersome. He believed that a German chemist some years ago devised a method for estimating naphthalene in coal gas by passing it through benzene, and then fractionating the benzene, and weighing the naphthalene found. This had been superseded as far as possible by Dr. Colman's method.

A hearty vote of thanks was accorded to the author for his interesting paper.

TESTS OF THE FLOW OF HIGH-PRESSURE GAS.

In two appendices to the paper on "High-Pressure Gas Distribution To-Day," read by Mr. H. L. Price at the annual meeting of the American Gaslight Association (see *ante*, p. 679), he gave the results of some tests made of the flow of gas through the pipes. It will be useful to reproduce these in connection with the paper.

Tests Made of the Flow of Gas through 22¾ Miles of 5 and 4 Inch Pipe between Aurora and Elgin (Ill.), April, 1905.

This high-pressure line runs due north, from Aurora to Elgin, through the towns of North Aurora, Batavia, Geneva, St. Charles, and South Elgin. There are about 1500 consumers on the line, mostly served by low pressure through district governors. There are about 2 miles of 5-inch pipe at the start; and the line is figured at the equivalent of 2½ miles of 4-inch. There are 16 bends—all long sweeps—and four 45-degree bends. Afternoon periods of minimum consumption were selected for the tests. The gas (coal gas with a small percentage of water gas, the specific gravity assumed as 0·6) was delivered into a small holder at Elgin, not in use, and measured by its rise. The test is rough, and finer corrections were ignored; but, balancing all factors, it is thought the observed figures are probably within 10 per cent. The St. Charles figures are the more accurate, as on this new portion of the line at this time few consumers were located, all of whom were closed off, and there were no distributing main systems connected. Each test lasted an hour from the time a state of equilibrium was established in the line.

No. 1.—Sunday afternoon, April 9. Pressure at Aurora, 15 lbs.; pressure at St. Charles (10 miles from Elgin), 7½ lbs. Amount of gas delivered into Elgin holder, 8400 cubic feet. Theoretical delivery, Aurora pressure and distance: Pittsburgh formula, 8528 cubic feet; Oliphant, 8112 cubic feet; Robinson, 8684 cubic feet. Theoretical delivery, St. Charles pressure and distance: Pittsburgh, 8070 cubic feet.

No. 2.—Sunday afternoon, April 16. Pressure at Aurora, 35 lbs.; pressure 1200 feet from Elgin holder (four bends intervening), 2 inches of mercury. Failed to get pressure at St. Charles. Amount delivered, 16,170 cubic feet. Theoretical, Aurora pressure and distance; Pittsburgh formula, 15,645 cubic feet; Oliphant, 14,882 cubic feet; Robinson, 15,932 cubic feet. Theoretical, nearby pressure and distance: Pittsburgh, 15,835 cubic feet.

No. 3.—Test failed; pressure was not maintained at Aurora.

No. 4.—Friday afternoon, April 28. Pressure at Aurora, 20 lbs.; pressure at St. Charles, 9½ lbs. Amount delivered, 9300 cubic feet. Theoretical, Aurora pressure and distance: Pittsburgh formula, 10,374 cubic feet; Oliphant, 9868 cubic feet; Robinson, 10,575 cubic feet. Theoretical, St. Charles pressure and distance: Pittsburgh, 9320 cubic feet.

No. 5.—Saturday afternoon, April 29. Pressure at Aurora, 50 lbs.; pressure at St. Charles, 30 lbs.; pressure 1200 feet from Elgin holder, 3·1 inches of mercury. Amount delivered, 22,860

cubic feet. Theoretical, Aurora pressure and distance: Pittsburgh formula, 20,743 cubic feet; Oliphant, 19,731 cubic feet; Robinson, 21,122 cubic feet. Theoretical, St. Charles pressure and distance: Pittsburgh, 20,360 cubic feet. Theoretical, nearby pressure and distance, 20,527 cubic feet.

The following is a summary of the tests:—

Gauge Pressure.	Actual Delivery. Cub. Ft.	At 1200 Ft. Distance. Cub. Ft.	Theoretical from Pressures at	
			St. Charles. Cub. Ft.	Aurora. Cub. Ft.
15 ..	8,400	— ..	8,070 ..	8,528
20 ..	9,300	— ..	9,320 ..	10,374
35 ..	16,170	15,835 ..	— ..	15,645
40 ..	22,860	20,527 ..	20,360 ..	20,743

Tests of the Flow of Gas through 1048 *Feet of* 1-*Inch Steel Pipe, September*, 1905.

This pipe was laid round the gas-works at Aurora from the inlet of the high-pressure line to the station meter. The turns were such long sweeps that they may practically be ignored. The gas used was coal gas made in Joliet or Elgin, admitted from the pipeline at the pressures named, and passed through the station meter (previously verified) at unchanged temperature into the Aurora holder. The pressures up to and including 17 lbs. were determined by a mercury gauge, and above 17 lbs. by a verified spring gauge. They were maintained constant during each test.

Gauge Pressure. Pounds.	Actual Cub. Ft. per Hour.	Pittsburgh Formula.	Departure from Formula.	Per Cent.
1·20 ..	550 ..	618 ..	−68 ..	11·0
3·09 ..	1100 ..	1119 ..	−19 ..	1·7
4·51 ..	1350 ..	1402 ..	−52 ..	3·7
5·02 ..	1620 ..	1671 ..	−51 ..	3·0
10·64 ..	2390 ..	2381 ..	9 ..	0·4
13·51 ..	2950 ..	2787 ..	163 ..	5·8
17·00 ..	3550 ..	3258 ..	292 ..	9·0
25·00 ..	4580 ..	4295 ..	285 ..	6·6
30·00 ..	5325 ..	4933 ..	392 ..	7·9
35·00 ..	6000 ..	5520 ..	480 ..	8·7
40·00 ..	6977 ..	6141 ..	836 ..	13·6

Only when special conditions obtained could these tests be made; and it is regretted that they could not be carried further. Plotting the results gave, however, practically a straight line after 6 lbs. The plotted line showed a steady departure at the higher pressures from the curve of the formula, which approached a straight line also, and suggested that a correcting factor could be discovered with more data of pressures and sizes to work from. The gravity of the coal gas was assumed at 0·5.

A Useful Work on Book-Keeping.

We have received from Mr. Effingham Wilson a copy of a useful little work entitled "Book-Keeping Down to Date." The author is Mr. Andrew Munro, who as Cashier to Messrs. R. & A. Main, Limited, of Falkirk, and as a specialist on rating questions, is pretty well known to Scottish gas managers. While the work does not apply specially to gas companies' book-keeping, it contains a large amount of information for gas officials, as well as others who have to look after the keeping of accounts. The author recognized in most treatises on the subject the outstanding weakness of containing too much; the exercises being unduly long, and the explanatory matter needlessly profuse. He therefore thought there was room for a text-book which would be more concise in character, and at the same time embody the latest practice in good accountancy. The present work is the result; and Mr. Munro's success in carrying out this idea may be judged by the fact that the first edition of his book was quickly exhausted and a second edition (the one under notice) called for. In preparing this, opportunity was taken to introduce several new features and exercises of a representative character. The chapter on income-tax—a subject of which the author has made a special study—has been considerably augmented; and the glossary of commercial terms and phrases increased by several pages. Mr. Munro is a medallist (1904 and 1905) of the Society of Arts, and also a holder of a teacher's diploma of the London Chamber of Commerce; and his extensive experience in the capacities of book-keeper, cashier, and teacher has enabled him to produce a work which has been acknowledged by experts to contain nothing that is in the least degree antiquated.

At the meeting of the Royal Institution on Monday last week, special thanks were accorded to Dr. Ludwig Mond, F.R.S., for a donation of £500 to the fund for the promotion of experimental research at low temperatures.

Among an unusually large number of associate members of the Institution of Civil Engineers elected at the first ballot of the session, which took place last Tuesday, we notice the following: Mr. H. R. Bickley, of the Gas-Works, Vercelli, Italy; Mr. M. R. Collins, of the Irrigation and Water Supply Department at Pretoria; Mr. A. H. Gilliland and Mr. D. L. Serpell, who are engaged upon the Derwent Valley Water-Works; Mr. A. S. Mason, of the Liverpool Corporation Water-Works; Mr. J. D. K. Restler, a student of the Institution; and Mr. G. H. Thiselton-Dyer, B.A., of the Portsmouth Water-Works. Another of the new associate members elected was Mr. Samuel Cutler, jun., to whom special reference is made under the "Personal" heading.

YORKSHIRE JUNIOR GAS ASSOCIATION.

On Saturday last, the members of the Yorkshire Junior Gas Association gathered in good numbers at the Town Hall, Dewsbury, for their usual December meeting.

The PRESIDENT (Mr. E. J. Sutcliffe, the Superintendent of the Birkshall Works, Bradford) delivered his

Presidential Address.

After thanking the members for choosing him as their President, Mr. Sutcliffe remarked that the preparation of an address, in these days of the multiplicity of Gas Associations, became increasingly difficult every year. He did not intend to speak in a general way on the recent progress made in the gas industry; but he proposed to say something which, if not of immediate service, would, he thought, be of use to the members in the future. The education of the would-be gas engineer was a subject of vital importance to each one of the members; and one of the greatest defects of the modern system of education was, not so much that it was not pushed far enough, but that it did not devote sufficient attention to groundwork. Many men, well up in trigonometry, he had found to be unable to construct a sentence grammatically; while others, equally brilliant in (say) chemistry, could not put together an ordinary business letter without mistakes in spelling. Higher or secondary education was undoubtedly of great advantage to all who could secure it; but it would be infinitely more so were it based in every case upon a good sound foundation. Professor Smithells, in his speech at the Association's inaugural dinner, said there was a difficulty in giving technical education to those who had not had the preliminary education. After referring appreciatively to remarks made by the "JOURNAL" on this subject, the President proceeded as follows.

From time to time, much has been written in our technical papers upon the subject of the education of the gas engineer and manager; but the bulk of it has been of too general a character to be of much service to a young man just commencing his studies. When I first began seriously to make a study of gas engineering, I was unaware of any published matter giving advice as to what course of study to pursue. I therefore wrote to a friend who had already traversed a few steps along the way which eventually led him to the chair of the national organization, asking for his counsel. I do not think I could do better than hand over to you his advice as I received it. After a few preliminary words, he said:

It is well to remember that in all technical and scientific matters a good mathematical knowledge is indispensable. This is so not only because every inquiry has eventually to be represented by figures or form, but because a mathematical training produces the highest intellectual power, enabling the possessor to more clearly apprehend any subject brought before him. This being so, my advice to a student of gas engineering is—first obtain the best knowledge of mathematics which you can; second, obtain a thorough knowledge of chemistry and of light and heat, also of the principles and practice of building construction and engineering. For the first, you should study for the requirements of a first class in the second stage of mathematics, at the same time taking, if you have the time, freehand and model drawing and practical geometry. After thoroughly mastering these, you should take up theoretical mechanics, practical plane and solid geometry, and applied mechanics. For the second, you could then take inorganic and organic chemistry, and light and heat; taking as you have the opportunity building construction and machine construction and drawing. Strive to obtain at least a first class in the advanced stage of each of the subjects named. By taking the subjects in the way which I have indicated, you will find them to lead on naturally, and those which have gone before will help you to a fuller appreciation of the more practical ones which follow. You will, besides this, have to study the special features of gas manufacture; but these are best considered after the preparatory training which I have named. You will see that a large amount of work will be required in order to be fully prepared for the many duties of the profession.

Since the time at which this was written, much of a more specific character has been said; and one of the best of the papers giving detailed information was that contributed by Mr. Thomas Berridge to the Midland Association in 1901. I would especially commend this paper to all who have not yet fully made up their minds as to what definite course of study to take. In order, however, that you may have the choice of many opinions, I give you (p. 752) a list of what has been said and written on the subject for a number of years past, and trust that the perusal of the articles named will give proper direction to your studies.

What I have said previously has referred more particularly to the preliminary stages of the education of the gas engineer. With regard to the study of gas manufacture and engineering proper, this will in all probability have been going on simultaneously with that of the other subjects already named—in the majority of cases the scientific knowledge having been gained at evening classes, while the day time was being devoted to practical work in some department of the gas-works itself. So much attention has been paid to this part of the subject in many of the articles named in the bibliography, that I will do no more than refer you to them. It must be borne in mind, however, that, as has been well expressed by the author of "The Simple Life"—"Education is, after all, only a tool; everything depends upon the workman who uses it."

I must not pass on to other matters without mentioning the very suggestive address given by my predecessor in this chair in

Presidential Addresses.

Geo. Livesey, Trans. Brit. Assoc. Gas Managers,	1874	p.	4
J. Paterson " " "	1875	"	20
R. Morton " " "	1876	"	4
R. P. Spice " " "	1877	"	3
C. Woodall " " "	1878	"	4
T. O. Paterson, Trans. Gas Institute	1901	"	23
W. R. Herring, "Journal of Gas Lighting," Vol. 77,	"		1195
H. E. Jones " "	" 86,	"	637
A. Masterton " "	" 88,	"	33
T. Berridge " "	" 89,	"	557

Articles in the "Journal of Gas Lighting."

"Gas Engineers and Technical Education," by N. H. Humphrys	Vol. 51,	p.	18
"Education of Gas Engineers," by Mr. Gimper . . .	" 53,	"	1129
"Gas Managers and their Positions"	" 56,	"	642
"Management," by T. Newbigging	" 59,	"	440
"Future of the Gas Profession" . . . . Vol. 76, pp. 1451, 1508,			1577
"Training of the Gas Engineer," by T. Berridge. . .	Vol. 77,	p.	536
"Qualifications of a Successful Gas Engineer," by J. Wentworth	" 79,	"	824
"Education of Engineers"	" 80,	"	1193
"Education of Gas Engineers," by R. H. Brown. . .	" 88,	"	327
"Training of Gas Engineers"	" 89,	"	766

Articles in the "Gas World."

"Education of the Engineer," from the Electrical Review"	Vol. 27,	p.	96
"Chemical Engineering," by J. B. Johnson	" 31,	"	969
"Education of Gas Engineers"	Vol. 34, pp. 308,		348
"Education of the Engineer," by Professor Perry . .	Vol. 37,	p.	412

June, 1904. There Mr. Cranfield unfolded a scheme by means of which he intended that every gas engineering student or pupil who had shown ability in science generally, and in the chemistry of gas manufacture in particular, would be able to supplement his general training by a course of instruction (in well and fully equipped laboratories under well-informed and capable demonstrators and lecturers) in the special technical tests and analyses usually met with in ordinary gas-works practice or in research work connected therewith. So far as I know, the thing has not yet taken definite shape, though it has been brought before the notice of the senior organizations. I can see that one great difficulty in the way of the seniors in districts taking any step is a financial one, and is due to the fact that each District Association is supported almost entirely by the subscriptions of the individual members, and not by the companies or corporations in whose employ the members are. It can scarcely be expected that engineers and managers themselves could see their way clear to subscribe largely to a fund for the establishment of such laboratories as Mr. Cranfield suggested—furnished with much expensive apparatus and instruments—in order that assistants in their own or in neighbouring towns may qualify themselves for higher and better-paid positions, leaving their chiefs so as to take up such positions at the earliest opportunity. No; the laboratories ought to be equipped, and partially, at least, maintained, by the gas authorities in the district; and the fact of there being no organization representing these bodies constitutes, I imagine, the chief difficulty in the way of the realization of Mr. Cranfield's idea.

The Midland Senior Association have during the past few months assisted the juniors in their district in such a manner as will, I hope, arouse the emulation of every other Senior Association in the kingdom. The handsome way in which the Midland seniors have formed and helped on their Junior Association is of too recent a date to need recapitulation; but I do hope that such assistance, pecuniary and otherwise, as they secured for their juniors, may be extended to other Junior Associations by the seniors of their districts.

Now that almost all of the Senior District Associations are affiliated with the Institution of Gas Engineers, I think that we and the other Junior Associations throughout the kingdom might take joint action in order to obtain affiliation of our Associations with the Senior Associations of our districts, and through them become also affiliated to the Institution of Gas Engineers as associate members, associates, or students.

A month ago, a new development of the Leeds University was announced—viz., the founding of a Chair of Applied Chemistry (Fuel and Metallurgy), and the appointment to it of Dr. Bone, F.R.S., contributions from whom have from time to time appeared in the "Journal of Gas Lighting." It is proposed that the position thus created should include, besides general metallurgy and the utilization of fuels of every description, the study of the manufacture and uses of coal gas. This is a step in the right direction, and one which we must feel delighted to welcome. I think that I can trace the hand of Professor Smithells in this scheme. The intimate connection which, through his research work, he has had for many years with the gas industry, the plea which he made for the higher scientific education of gas engineers in this country in the post-prandial speech already alluded to, and the great interest he has shown, and the encouragement and assistance he has always given, to us as an Association of Junior Gas Engineers, are all practical evidence of his sympathy with such a project. In the speech just referred to, after speaking of the lack of scientific masters of the craft of gas making, Professor Smithells said that he had in his mind more than one measure that might be taken to remedy this state of things; and though I may be wrong, I think that this most recent development at the Leeds University is the outcome of Professor Smithells's efforts to remove from the British gas industry the stigma that it is lamentably wanting in men who are scientific masters of their business. I am persuaded that the whole profession most heartily appreciates his endeavours to supplement in this practical manner all the kindly advice and assistance he has previously rendered. In this district we ought to use every means in our power to make this new scheme a success from the commencement, as some small acknowledgment to Professor Smithells and the University authorities for the encouragement and help they have given us in the past; and I hope that the next generation of Yorkshire Juniors will avail themselves to the utmost of the opportunities at Leeds University, and equip themselves with that high and deep scientific knowledge which Professor Smithells referred to, so that within the next two decades brilliant men may be common in gas-works of Yorkshire.

The President next referred to the difficulty of keeping in touch with all the most useful portions of the technical and scientific journals; and he said that, in order to have, as far as possible, at his fingers' ends for ready reference any matter or subject which he had not got in his head, he began to cast about for a method of indexing the technical literature he possessed. The plan he ultimately adopted was to obtain a book of about 350 pages. The first fifteen pages were devoted to an index of subjects in the book. Every subject for which it was thought advisable to have a separate heading was given one—any error being rather on the side of having too many heads than too few. He then numbered the remaining pages of the book, allocating them to the different subjects in the index, and placed opposite each heading in the index the number of the page on which articles on that subject were referred to. In every reference he entered the full title of the article or paper, the author's name, and where it was to be found. He kept a separate index for each periodical; and the advantages of being able to refer in a very few pages to all that had been written on any particular subject were invaluable. Another important point was the taking of notes and the keeping of note-books. They should put down anything and everything that they thought might possibly be of service in the future. They need not be over fastidious as to keeping the book clean; but all possible dimensions should be correct and plainly given. Sketches saved a lot of description, and therefore should be encouraged. Opinions should not be recorded unless they were those of an authority on the subject under notice. Every entry should be indexed and dated; and if a camera could be brought into service, a very valuable record of work done could be made from the combination. When any alterations or extensions were being made, especially if they would ultimately be hidden from view, photographic records should be taken at different periods up to completion; and these, along with the notes made, would be of great value. Of course, also, a properly indexed newspaper cuttings book would be useful for preserving particular articles from periodicals which it was not desired to store.

The President then referred in the following terms to the character of the papers that should be submitted. He said: As far as I am aware, our Secretaries have not had any difficulty hitherto in the preparation of the programmes for the ordinary meetings; but it is not to be anticipated that this will continue to be the case. I think it would be of benefit to every one if we had more and shorter papers. Provided it has interest, I think a paper of five or ten minutes' duration, in which the matter was kept well to the point, would lead to better discussion, and therefore be of greater value, than a dissertation of three-quarters of an hour, two-thirds of which was taken up by historical and other detail known already to 99 per cent. of the listeners. Padding is always a great waste of time; and it is irritating to have to sit and listen to it. I would therefore urge each and every member, when he comes across anything unusual or unexpected in the course of his duties, to make notes of it with full details, and to prepare a short paper upon the subject. As an example of what I mean, I may point to a case which would have made a good subject for such a paper, and many similar ones might come under your notice.

Until the publication of Abady's "Gas Analyst's Manual" in 1902, I was unable to find in any book or journal, and not even in Wanklyn's "Gas Engineers' Chemical Manual," any mention of some facts which are liable to upset all calculations in the estimation of ammonia, carbonic acid, and sulphuretted hydrogen in crude gas by means of the Wanklyn bottle. You will all be aware that, in using this apparatus, the bottle is first filled with the gas to be tested, and the impurity sought absorbed by washing with known absorbents, and estimated volumetrically. In testing for these three impurities some time ago in conjunction with Mr. W. J. Dowse, one of our members, some very discordant results were obtained—such as finding ammonia at the purifier inlet after proving the gas to be free from it at the washer outlet. After consideration, we concluded that the different condition of the bottles when taking samples was the cause of our troubles. In making our first tests each day, all the bottles used would be dry inside; but in all subsequent ones the insides would be wet after washing out with the reagents and water. The moisture on the sides of the bottles exposed to a current of crude gas absorbed ammonia quickly, and also, though to a less extent, carbonic acid and sulphuretted hydrogen.

To verify our theories, we made many tests with wet and dry

bottles filled at the same time and place; and I append some of the results obtained—

Sample taken from—	Condition of Bottle.	Grains of Ammonia per 100 Cubic Feet.
Scrubber inlet	Wet	916
,, ,,	*Dry*	*183*
,, ,,	Wet	1086
,, ,,	*Dry*	*295*
,, outlet	Wet	325
,, ,,	*Dry*	*65*

In each of the above three tests, the gas was blown through a T-piece into each bottle simultaneously for one minute.

With sulphuretted hydrogen, the error was not so great as with ammonia, but quite sufficient to vitiate the figures obtained.

Sample taken from—	Condition of Bottle.	Grains of Sulphuretted Hydrogen per 100 Cubic Feet.
Scrubber inlet	Wet	1410
,, ,,	*Dry*	*1270*
,, outlet	Wet	.1140
,, ,,	*Dry*	*1050*

The use of wet bottles in testing for carbonic acid does not show such an increase in the amount of this impurity as in the case of ammonia and sulphuretted hydrogen, but wet ones certainly do give higher results than dry ones.

Another point brought out in these investigations was that india-rubber and glass tubes and fittings should not be transferred from one place to another in order to take samples of gas, but separate tubes and fittings used at each place at which a test is made, as they absorb quite an appreciable quantity of ammonia, and the error is accentuated if the tubes, &c., be wet. A test was made on gas at the purifier inlet in the usual way; and it was proved to be free from ammonia. Immediately after this sample was taken, another bottle was filled through an india-rubber and glass tube which had been in use at the scrubber inlet previously; and the result showed the presence of ammonia to the extent of 47 grains per 100 cubic feet. The necessity of using tubes in this way, I have never seen recorded anywhere.

I have mentioned these things here principally in order to point out that such a series of experiments and results might form the basis of a short paper which, if not provocative of much discussion, would at least bring before the notice of the members matters not referred to in text-books but none the less important. No doubt many things equally important are observed by some; and I should be glad to afford an opportunity at the meetings during the coming year for any such to voice their experiences or observations in a short paper, if only of five minutes' duration. I have many times been struck with the brevity of the papers read at the annual meetings of the French Society, and thought it an example worthy of imitation.

Allusion was, in conclusion, made by the President to the need, on the part of those who intended making their mark in the gas world, of perseverance, tact, quick observation, and knowledge of human nature.

Though, in accordance with custom, there was no discussion on the address, many appreciative words were spoken in passing a vote of thanks to the President—on the motion of the two Vice-Presidents, Messrs. G. W. Fligg and J. H. Hill. Mr. Sutcliffe returned his thanks, wishing the members a useful and successful year, and promising his best services on their behalf.

Then followed an address by the Ex-President (Mr. W. Cranfield) on "A Visit to the Amsterdam Western Gas-Works," in which special reference was made, in some detail, to the 3½ million cubic feet holder in its mid-air annular tank (which was illustrated and described in the "Journal" for July 11 last, p. 104), and to the Kramers and Aarts blue water-gas plant. After a number of questions had been dealt with, a vote of thanks was passed to the speaker, on the proposal of Mr. J. F. Smith, seconded by Mr. L. Whitaker.

In his address, the President had referred to the notable expansion of the work of the Leeds University by the recent establishment of a Chair of Applied Chemistry, which was meant to deal very largely with fuel and gas making. At the close of the ordinary business, this matter was again raised, and several speakers voiced the general sentiments of the members; expressing their delight at the great privileges that would thus fall to the lot of some of the future juniors of the gas industry, and their hope that a department fraught with so much promise would receive generous assistance towards its endowment and equipment. A message of congratulation and good wishes was ordered to be sent to Professor Smithells (one of the honorary members of the Association), to whose initiative and advocacy the establishment of this new department is so largely due.

The following resolution was passed unanimously by the Hull City Council at their meeting last Thursday: "That, in recognition of the eminent services rendered by Alderman Watson Arton Massey to the city, and as a member of the City Council for the last 25 years, as Chairman for six years of the Water and Gas Committee, and Chairman for eight years of the Parliamentary Committee, this Council desires that some recognition of his services to the City and Council should be made; and that it be referred to a Committee to give effect to this resolution."

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

A Meeting of the Scottish Junior Gas Association—Western District—was held in the Technical College, George Street, Glasgow, on Saturday. There was a large attendance, presided over by Mr. J. Bell, of Airdrie, the President. The business of the evening was to hear a lecture by ex-Bailie Burt, of Glasgow, who is at the head of the Acme Gas-Engine Company, Limited, of Shettleston, Glasgow.

The President, in introducing the lecturer, said that ex-Bailie Burt had extended to the members the privilege of discussing his remarks.

Ex-Bailie Burt then delivered his lecture, its subject being

THE DEVELOPMENT AND ADVANTAGES OF GAS-ENGINES.

He began by giving a few historical particulars, and said that the year 1860 might be looked upon as the starting-point of the modern gas-engine; this being the year in which Lenoir produced the first practical working engine. Six years later came the Hugon engine. In 1862, the question of compression was raised, and the fundamental principles of the gas-engine set forth, by Beau de Rochas. These principles were practically applied by Dr. Otto in his celebrated engine. In 1880, Mr. Dugald Clerk invented and introduced his two-cycle engine, which might be said to be the forerunner of the large motors of the Oechelhaeuser and Körting types, so much favoured by Continental engineers. All compression engines being based upon the same principle, the lecturer gave a brief description of the operation of the four-cycle engine, and said the two-cycle engine was the application of the same principle in a different way. In considering the question of relative merits of the two cycles there was material for an interesting discussion, which would be outside the scope of the present lecture; but the various points might, he thought, be briefly considered. He then proceeded to deal in succession with the objects aimed at in the construction of all prime movers—viz., reliability, efficiency, economy, simplicity, and low first cost.

Having shown that the gas-engine is a thoroughly reliable and efficient motor, the lecturer passed on to consider the third point named—its economy—basing his calculations on the cost of working in Glasgow. On this subject he said: Taking first engines using town gas, which can at present be obtained for 1s. 9d. per 1000 cubic feet, an ordinary type of engine of 45 brake-horse-power will, under test, develop one brake-horse-power for 14 cubic feet per hour. This works out at less than 0·29d. per brake-horse-power-hour; but making an allowance which I think should be made, as engines are not always working under test conditions or at full load, a consumption of ⅛d. per brake-horse-power-hour may be assumed. Thus 45 brake-horse-power-hour would cost 1s. 3d. per hour, and for 56 hours per week would amount to £3 10s. A fourth of a man's time at (say) 24s. per week is 6s.; and 4s. for oil would bring the total cost up to £4 per week. A steam-engine of 45 brake-horse-power would consume about 7 lbs. of coal per brake-horse-power-hour, which at 8s. per ton would amount to £3 4s. per week. Other charges would be about 6s. per week for water, 24s. for attendance, 4s. for oil, and 5s. for the carting away of ashes; making a total of £5 3s. per week, against £3 10s.—a saving of £1 13s. It is extremely difficult to obtain reliable data as to the actual working cost per brake-horse-power of small steam-engines; but recently a 25 brake-horse-power Acme gas-engine replaced a steam-engine at the works of Messrs. John Wallace and Sons, Limited, of Glasgow, where the working costs had been carefully kept, and the results are as follows:—

Steam Costs.

Average quantity of coal used per four weeks, 13 tons 10 cwt., costing 6s. per ton delivered	£4	1	0
Carting ashes, five loads at 1s.	0	5	0
Water per month	0	5	0
Man's wages, 20s. per week	4	0	0
Total cost per four weeks for steam	£8	11	0

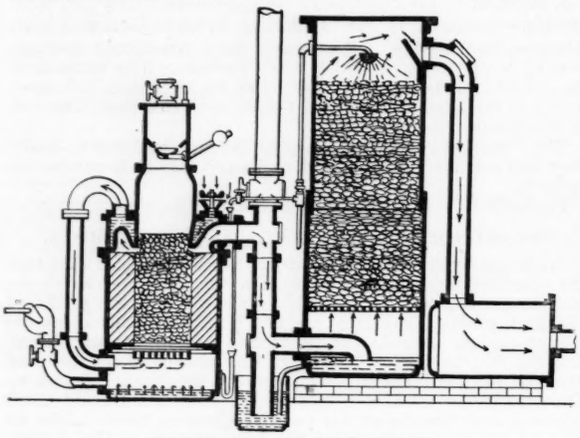
This was a good modern steam-engine with multitubular boiler. The gas-engine was run for four weeks doing the same work, *plus* two small machines that were added. The gas consumed was 42,000 cubic feet, and the attendance would be about 1½ hours per day, which works out as follows:—

Gas, 42,000 cubic feet, at 1s. 9d. per 1000	£3	13	6
Attendance, at 3s. 6d. per week	0	14	0
Total for town gas for four weeks	£4	7	6

This shows a saving with town gas over steam of £4 3s. 6d. per month, or nearly 50 per cent.

The lecturer proceeded to deal further with the question of economy as follows: Another claimant for the favour of the power user has lately come into the field in the shape of the suction gas-producer; and as this is a competitor which it will take all the energy and ingenuity of the public gas supply corporations to meet, a brief description and a few authentic figures as to its performances will, I think, be interesting to the Association. The accompanying illustration [see p. 754] will indicate the construction of the apparatus.

In the recent tests held under the auspices of the Highland and Agricultural Society of Scotland [see *ante*, p. 454], about 25 brake-horse-power was obtained for a fuel charge of 1d. per hour; the coal costing about 9s. per ton delivered. The following figures,



Acme Suction Gas-Producer.

supplied by Messrs. John Wallace and Sons, Limited, give the actual working cost of the engine already referred to when working with suction gas; both costs being obtained from the engine doing the same work:—

Cost of Suction Gas.

Average coal used per four weeks, 2440 lbs.; 1 ton 1¾ cwt. anthracite coal, at 17s. per ton	£0	18	6
Attendance, at 6s. per week	1	4	0
Working costs for four weeks	£2	2	6

To this must be added, when comparing with town gas, the interest and depreciation on the cost of the plant and extra cost of the engine. The producer and the extra cost on the engine, which is of 25 brake-horse-power, would come to about £100. Taking 15 per cent. interest and depreciation, this would amount, at 50 weeks per annum, to 6s. per week; interest and depreciation, four weeks, at 6s., £1 4s. This brings the total cost up to £3 6s. 6d. for four weeks, or a saving of 25 per cent. on town gas at 1s. 9d. per 1000 cubic feet. This figure was obtained with coal costing 17s. per ton; it can now be had for 8s. 6d. per ton. In both cases the engine was working, as near as could be estimated, at about two-thirds of its full power.

The next point taken up was the question of how the competition with which they are faced is to be met by gas managers; and on this subject the lecturer said: I do not think it possible for them to keep supplying engines of over (say) 50 brake-horse-power, as the capital cost of the producer increases very slowly in proportion as the power increases; but under this I think it is possible for them to devise measures to retain what is practically all their present demand, if not to increase it. The only method I see of accomplishing this is to reduce the illuminating power of the gas, and consequently the price, to such a point that, up to the power I have mentioned, it would hardly be worth while installing suction plants. The same heating value would require to be sold for about two-thirds the price now charged. Such a gas would, I think, be more extensively used than at present for commercial and domestic purposes; and it rests with the gas corporations to decide whether such a policy is worthy of their consideration, for there is no doubt that, with or without their assistance, the gas-engine will, in the near future, become the principal source of power generation.

Mention might here be made, Mr. Burt said, of the electric motor receiving its current from a central-supply station. As current is now being sold for large demands at from ¾d. to 1d. per unit, a comparison may be interesting. An electric motor absorbs about 0·9 unit per brake-horse-power-hour; so that a 45 brake-horse-power motor, with current at 1d. per unit, would cost £9 9s. per week, and at ¾d. per unit £7 1s. 9d. per week.

The lecturer next took up the question of the gas-engine in its larger units, on which he made the following remarks: The first thing which may be said to have opened up the field for large gas-engines was the discovery that blast-furnace gas could be successfully used. In February, 1895, I had the honour of supplying and fitting up for Mr. Thwaite a 30-horse power "Acme" gas-engine at the Glasgow Iron and Steel Company's works at Wishaw. This was, I believe, the first gas-engine in the world to work blast-furnace gas. It ran successfully for years, providing the electric light for the works at a consumption of 95 cubic feet of gas per brake-horse-power per hour, which was equal to an electrical horse power for every 1¼ to 1½ lbs. of fuel put into the furnace to make iron—a result which I do not think has been yet surpassed by any of the large Continental engines. With an indifference to new possibilities which appears to have been general in this country about ten years ago, this discovery was allowed to lie dormant; while the Belgians and Germans, with that enterprise which has now become our admiration and envy, took the matter up enthusiastically, with the result that the great majority of the large engines made to-day are of either Continental manufacture or design. It is easy to see how this has hampered the gas-engine builders in this country, as they had here the only supply of cheap gas available at the time; and the want of enterprise on the part of the large ironmasters closed to them the field of experiment open to their Continental rivals. The advent a few years ago of the Mond type of gas-producer and the extensive experiments carried out by Messrs. Brunner, Mond, and Co., afforded the opportunity in this country for some further developments; and now during the last few years the gas-engine has been coming rapidly to the front, and installations of thousands of horse power are being erected. Of even more recent date, the introduction of the suction gas-producer has opened up still wider possibilities, until now—in theory, if not in actual practice—the gas-engine stands fully in the front of all competitors as an economical generator of power. While this is true, it is also true that gas-engine makers have to fully substantiate their claim to this position; but I think, with the opportunities now open to them, it is only a question of a very short time.

In opening, I made mention, in a general way, of the two main types of gas-engines in use at the present time—the two and the four cycle engines. It is extremely difficult to predict exactly what type and form will finally survive as the standard pattern; and probably, like the steam-engine, different styles will be used for different kinds of work. At the same time, judging from the present tendencies, the type most in demand will be that most suitable for the driving of dynamos for electrical generation. In steam-engine practice at the present time, the high-speed vertical type seems to be most used for this purpose; and it appears reasonable to suppose that if a gas-engine of similar form and action can be successfully made, it would meet with an equal amount of favour. An engine of this type must, to be of any great value over the horizontal form, be of high speed, and capable of direct coupling to the dynamo. The two great advantages thus gained are the minimum amount of floor space and the low cost of the dynamo. I do not think, so far as my knowledge goes, that an engine of this pattern can be successfully worked on the two-cycle system.

After some reference to gas-engine construction, ex-Bailie Burt closed his lecture with the following remarks: It is certainly beyond dispute that the modern gas-engine, up to (say) 100-horse power, is by far the most economical power generator in the market to-day, both in working and capital cost, as well as the most simple and easily managed. The capital cost of a 50-horse power installation for town gas would be about £6 per horse power, including foundations; and a 100-horse power engine and producer, complete with foundations, would cost about £8 per horse power. As reliable data as to costs of large installations are not yet available, it is not possible for me to give accurate figures; but presuming that the costs do not decrease as the units get larger, I do not think that any large first-class steam installation can be erected at much less than this, when the cost of chimney-stalk and boiler-seats are taken into account. As for working costs, even presuming no improvement can be attained over the smaller sizes, the gas-engine is better on this point than any authentic figures I can obtain regarding the steam-engine. For instance, the fuel account of the Glasgow Corporation Tramways Department shows a cost of 0·12d. per hour per unit generated. A gas-engine and suction-gas installation would generate a unit for about 0·07d. with coal at 10s. per ton. For the purposes of comparison, I will take the total for a year's working of the tramway station (1903). The units generated are put at 23,918,863; and the cost of coal (35,267 tons, at 6s. 4·814d. per ton) is £11,498 10s. If this power had been generated by gas-engines at the fuel cost I have given—viz., 0·07d. per unit—the coal used would have been 13,952 tons, which at 10s. comes to £6976; representing a saving in fuel of £4522. To this must be added the saving in handling the smaller quantity of fuel and ashes. This is not given separately in the Corporation accounts; but in a paper recently read by Mr. A. W. Bennis before the Keighley Association of Engineers, on the economy of mechanical stoking, he put the cost of handling coal and ashes for a 7500-horse power boiler plant at 6½d. per ton. As the difference in weight would be 21,315 tons, at 6½d. per ton, this would mean an additional saving of £577, or a total of £5099. With figures such as these, one might well ask, Why are steam installations still being erected? Frankly, I do not know any good reason, unless it be the good old excuse that they do not know any better. However, it is satisfactory to know that this indifference is not general, as the following quotation from Sir Alfred Hickman's Presidential Address to the Wolverhampton and District Engineering Society shows. He said:

> The first thing which struck anyone was the change with regard to motive power. The supremacy of steam had not only been challenged, but they might almost say that it had been superseded. He had put on the scrap heap no fewer than 24 valuable steam-engines within the last few years, and replaced them with electric motors driven by gas-engines. He might say that his managers had calculated that the saving in fuel alone by this operation had amounted to £7500 a year. The saving was not in fuel only, because engines driven by electric motors required much less attention in maintenance; and therefore he considered the saving would considerably exceed the sum he had mentioned. At his works they had still some steam-engines; but he believed they would eventually be either relegated to the scrap heap or

be used as stand-bys. Really, it seemed that the whole system of motive power was being revolutionized.

Ex-Bailie Burt added that since he had prepared his lecture he had received a very important communication, part of which he believed it would be to the interests of the Association that he should read. The engine of which he had shown them the design was going to Mexico, and the engineers who were representing his firm there were very much interested in the gas-engine question themselves. He received a letter from them a few days previously in regard to what was being done in that part of the world. There had been many failures, due to the want of experience on the part of those in charge of the work. This gentleman wrote of a gas-engine (American made) installation which had been fitted up in Mexico, at a high altitude, where, on account of the difficulty in getting a water supply, they used the same water over and over again till it was quite black. The engines went out of order, and were practically reconstructed. Now the people were thoroughly satisfied with them, and had given an order for three more engines, each of 250-horse power. The troubles were such as everyone had had, more or less; but it was very courageous of these people, after going through the experience they had done, to double their order. Of course, in Mexico, fuel was very dear; and this might induce them to take a risk which everyone at home would not do.

Discussion.

The PRESIDENT thought the members might congratulate themselves on having secured Bailie Burt's services. His lecture had been a piece of painstaking work, and he was sure they had enjoyed it. He considered that low illuminating power was the main thing in connection with the opening up of the field for gas-engine work.

Mr. A. WILSON (Glasgow) said the first thing they must do was to congratulate Bailie Burt most heartily upon his contribution to the proceedings of the Association. The members were very pleased to have all the costs laid before them in the way the lecturer had done. The costs which he gave were certainly very instructive. He wished that they were more generally known. He had worked it out in this way—that gas at 1s. 9d. per 1000 cubic feet cost per hour 6·34d., against 1s. 1½d. for steam and 1s. 6d. for an electric motor. So that, taking these figures, he most certainly thought they had great cause to congratulate themselves on having a very good position in the supply of power to the users of it. He was not going to blink in the slightest the facts in regard to the figures for suction gas. It was the most formidable competitor suppliers of coal gas had to face. But they were not going to run away from it; they were going to see what they could do to keep power business in their own hands. He considered that the line they took in Glasgow last year, in reducing the price of power gas, was a step in the right direction; and he believed Bailie Burt would be inclined to say the same. But while they had reduced the price to 1s. 9d., he did not think they were going to stop at that. They were going to lower it still further, so that they might compete more advantageously with suction gas. Of course, in doing this, they must be careful they did not do harm to their other consumers. But when the electrical people could supply power for motors at such a low rate as they did, he held that gas people must be allowed to go on similar lines. And, taking into consideration the fact that gas for power was used all the year round, and consequently entailed much less capital cost in works and mains, they surely ought to give the user the advantage of this lessened cost. It was rather a difficult subject to deal with, in a way; but he thought they would be quite able to face the question. And when they took into consideration the benefits and the comforts of a town gas supply, compared with a suction gas supply, even if the cost were not quite so low, probably they would be able to get a large fraction of the power users on their side. It was a great comfort to merely run into a works a pipe from which they could have a regular supply—a certain supply—at all hours of the day and night, week in week out, against even the best producer, which was apt to make mistakes at times; and, in addition, with producer gas, there was always the necessity for supervision, which cost something.

Mr. J. NAPIER MYERS (Saltcoats) said he wished to add his meed of thanks to Bailie Burt for the lecture he had prepared for them. He (the speaker) had been familiar with gas engines for many years; but it was not until that night that he thoroughly understood their operation. In their early days they were doubtless somewhat wasteful motors. But someone had said they must never judge of the ultimate success of any process by the initial effort; and he had no doubt there was a great future for the explosion engine. He was not able to criticize Bailie Burt; but if he rose to answer any questions which might be put to him, he hoped he would give members from the country a little instruction as to the best way to supply gas-engines with gas. They were all familiar with Mr. O'Connor's rule as to the size of the meters required for gas-engines. Their difficulty in the country, however, was that they found a man would come with a gas-engine, which he told the customer was only to cost 1d. per hour for gas; and he came to the gas manager and made demands for meters and service-pipes to supply perhaps a shillingsworth of gas per hour. Between these two statements there was very often cause for a good deal of friction. He would also like Bailie Burt to tell them which was the best type of meter, the wet or the dry, with which to supply gas.

Mr. J. LOWE (Glasgow) remarked that the subject of gas-engines was creating great interest just now among engineers. He noticed Bailie Burt mentioned the principles of gas-engine construction laid down by Beau de Rochas, in the early days—about 1860. It was of interest to note how these principles had never been departed from, though it was many years before they were put into practice. They heard constantly that the efficiency of the gas-engine had been due to increased compression; and they had almost begun to look upon this as an axiom, and were apt to forget, or rather to fail to inquire, why this should be so. When they compressed the gas charge before ignition, they had negative work; and it would do no more than give it out again on expansion, which, they knew, gave the increased efficiency. In the earlier engines, which were without compression, the expansion was carried down, at the end of the stroke, beneath the atmospheric line—the actual negative work of the stroke. By increasing the compression, they got over this. Of course, this also gave them the highest pressure at the beginning of the stroke, simply by increased compression. Comparing the four-cycle and two-cycle engine, there were one or two reasons for preferring the four-cycle engine. From the frequency of the explosions, the temperature was much more difficult to deal with in the two-cycle engine, because there were double the number of explosions per minute. Of course, on this account, the two-cycle engine might be made smaller. This was one point in favour of the two-cycle engine which he thought Bailie Burt had omitted to mention. Another was that this engine gave them a more uniform turning movement. Speaking of the practical side of the question, the figures put forward by Bailie Burt were very interesting, but rather visionary. If he remembered aright, at the tramway station in Glasgow there were four 4000-horse power steam-engines, and one of 800-horse power; and, so far as he knew, there had never been gas-engines built which would develop this power. He had seen gas-engines of 1000-horse power at work at Dalmuir; and he thought he was right in saying that each of them was larger than the 4000-horse power engines at the Pinkston tramway station. And certainly they seemed much more effective, without water cooling in every part. He did not think there were any gas-engine builders who would undertake a contract to equip with gas-engines a tramway station such as that at Pinkston. The vertical engine Bailie Burt had described seemed to him (Mr. Lowe) to embody a first-rate idea. It was something after the Willans and Robinson steam-engine, which had been, and still was, a very great success for fast driving. He was glad Bailie Burt did not introduce into his lecture the question of gas-turbines. A great deal had been said about them lately; but he did not think they were likely to be a success.

Mr. DURWARD (Glasgow) asked how they could get a very large horse power from a gas-engine unless they ran it slowly. He had had some little experience with large gas-engines. At present, in South Africa, they were erecting a great power station, where there would be four engines, of at least about 2000-horse power, several of 1000-horse power, and some of 500-horse power. This was one instance in which they were tackling large engines. He would like to know how they managed at Dalmuir with a slow speed and big power.

Mr. S. B. LANGLANDS (Glasgow) asked whether in large works, where units of energy were wanted, they could not, as coal gas producers, meet the demand better than it could be met with suction-gas producers. If a number of small gas-engines were put down through a large works, they would meet the requirements of the works better than could be done with one huge engine with a suction producer and transmission, because a great deal of energy was lost in transmission. In regard to the extent of compression in the cylinder, he fancied it was not so much a question of the amount of compression as of the perfect admixture of the constituent elements in the cylinder. If by some means this admixture could be made perfect, the efficiency of the engine would be complete. In conversation with people who had been using suction producers, they always admitted that town gas was cleaner in the cylinder, and that in every case a fortnightly overhaul of the piston was necessary, where a six-monthly overhaul might only be necessary with town gas.

Mr. W. WILSON (Kirkintilloch) thought Bailie Burt was proceeding on the right lines, in producing a vertical engine. He remembered seeing an engine working, very much like that in design; but it was operated by coal dust. The coal dust was pulverized, and was showered into the cylinder, on to a hot plate, which was kept hot by the explosion in the cylinder; and it was there gasified. The cylinder of the engine was turned into a complete gas-works; and as they knew the impurities that had to be taken out of the gas, it struck him that the life of the engine would not be very long—that, in fact, it would be practically poisoned in its youth, and the grit in the gas would wear out the cylinder in no time. Though a great deal had been said about adopting coal dust as an explosive, there was no fear of it cutting them out. They had more need to be afraid of suction gas; but in small towns they had not much reason to fear that. Not many users of engines below 50-horse power were likely to put them in, if they could get a cheap supply of gas. He agreed that if a little concession could be made to users of gas for power purposes, as they furnished a day load, it would be advantageous to both parties.

Mr. J. MACLEOD (Provan) asked what work had been done in the way of getting the correct proportions of gas and air for the explosions. Had there been any investigations into the problem

of finding the maximum explosive intensity of the mixture of gas and air?

Mr. R. SHEPHERD (Glasgow) inquired about the starting of gas-engines. He was sure many members of the Association were often called in when an engine stopped; and perhaps Bailie Burt could give them a few hints as to what should be done.

Mr. J. FRASER (Provan) said he had been informed by a gas-engine expert that the bolts through the crank brasses should be renewed yearly, as the thrust would break them. He disputed this, because the thrust was always one way. Could Bailie Burt tell them if this was so?

Other questions put were as to the lowest possible pressure at which a gas-engine could work, and whether the india-rubber bag would, after a number of years, deteriorate with working.

Ex-Bailie BURT, in replying to the discussion, said he felt very gratified by the flattering remarks which had been passed on his efforts. So far as the discussion had gone, he had material for reply which would occupy three or four nights. To begin at the end, he never considered the pressure of gas in the pipes, unless the engine was fired by a hot tube. One of the great difficulties in working a gas-engine was in keeping the bunsen burner alight. They required a certain pressure for this. Of course, gas-bags would get out of order in time. Some of the older ones he had seen were made without valves; and they would not work well. As a matter of advice to gas managers, he would say that they would generally find that one of the greatest difficulties in connection with the gas-engine was the ignition. It did not matter how much gas they had, if it was not ignited they would not get the engine to go. A very common trouble was that the tube was old and crusted up, or the bunsen burner was not heated up properly. Things would break; but he must say that, after twenty years' experience with gas-engines, he did not remember a case of the connecting-rods breaking; but he expected that if they did break it was because of the fly-wheel key getting slack. The first thing a man should do who was sent for to see to a gas-engine was to look at the fly-wheel key, and ascertain if it was tight, because if it were slack it would produce a knocking effect. As to the proper mixture of gas and air, of course experiments had been made on this matter; but it depended a great deal upon the calorific value of the gas. Anyone who was in the habit of working gas-engines could tell, almost by the sound of the explosion, whether he was getting a proper admixture; but no one ever thought of measuring the quantities. With Glasgow gas of 22 or 23 candle power, they could work with a pressure of from an inch to 12-10ths. He thought he took out the first patent for a tandem engine; and he felt confident and satisfied that it was *the* engine, so far as the four-stroke cycle was concerned. The question of a gas supply for power purposes had got to be faced, just as the electricity people had faced it, by realizing who were to be their best customers. To his mind, gas managers did not make the most of this point. If they had their plant standing idle for months in the year, they were just in the same position as the electricity people, who had no storage. He had calculated that the capital charges for gas and electrical purposes were about the same; and if their gas plant were standing idle all the summer, they had to meet the same capital charges as the electricity people. But the electricity people were getting over this by catering for an all-day load. Gas corporations appeared to be too independent to do this. A suggestion he had made was that they should sell their gas for half the price one six months which they did in the other six. This would give the man who used it all the year round a lower average price. The question of the compression of the gas had not been settled yet. The effect of the wall action caused a good deal of controversy. His theory was that, in one sense, when they compressed the gas hard, they got more rapid combustion; and the whole theory of the gas-engine was to take this heat out as quickly as they possibly could. He did not know whether a wet or a dry meter was the best for gas-engines. So far as the supply was concerned, they generally regulated this by the size of the pipe. Nobody who knew anything about the gas-engine question would suggest that they should do what the tramway people had done, when they erected the great central station at Pinkston. They developed there a high-tension current, and sent it through mains, to be converted, all over the city. If they had put down gas-engines at these converting stations, each station would have been a generating station for itself; and they would have saved the cost of the distribution of it. And he did not believe that the gas installations would have cost much more than the transforming installations which they had. They could have put down a whole series of gas installations, each one of which would have been independent; and they would have saved the cost of the distribution.

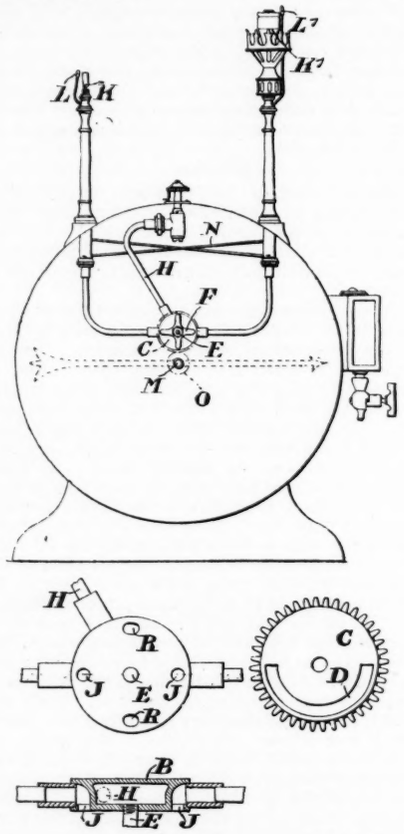
On the motion of the PRESIDENT, a vote of thanks was accorded to ex-Bailie Burt for his lecture.

The Supply of Gas at Crewe.—Correspondence has been passing between the Crewe Town Council and the London and North-Western Railway Company, with reference to the proposal of the former to purchase the gas-mains belonging to the Company. In the course of it, the Directors intimated that they had considered the matter; but as they were prepared to continue supplying gas to the inhabitants, they did not desire to treat with the Corporation for the sale of the mains. The Council have now directed the Town Clerk to write to the Company intimating their intention of applying to Parliament for powers "to become the gas authority" of Crewe, and to purchase the mains.

REGISTER OF PATENTS.

Comparing the Illuminating Effects or Consumption of Gas-Burners.—Bennet, J. H., of Edinburgh. No. 24,975; Nov. 17, 1904.

This apparatus, for comparing the illuminating effects or the consumption of different gas-burners, has for its object to provide a compact form of apparatus which can be used in conjunction with, and actuated by, a test meter. An improved form of valve is situated between the meter and the burners to be tested; the valve being actuated by the meter mechanism so as to control and deliver gas to the passages communicating with the several burners one by one, whereby the illuminating effect or the gas consumption of the various burners can be compared.



When the illuminating effects and gas combustion of two burners are to be compared, a rotary valve is provided in the casing of the wet test meter, consisting of two parts—viz., a shallow cylindrical casing B, having four ports on its plane surface, situated on diameters at right angles to one another, and a circular disc C, toothed on its periphery, and having a semi-circular groove D on the face adjacent to the casing. The circular disc revolves on a stud E, situated centrally on the casing, the pressure necessary to secure a gas-tight joint between the two surfaces being supplied by a spring F (the tension of which is adjustable) situated on the stud on which the circular disc revolves. The valve casing is preferably attached to the front plate of the meter, and a pipe, H, for measured gas, is connected to the back of the valve casing and communicates with the ports R, which are situated on a vertical diameter. The other two ports J, arranged on a horizontal diameter, communicate with the burners K K¹ to be tested. A pinion O, fixed on the pointer spindle M of the meter, gears with the periphery of the circular disc before mentioned; the number of teeth on the pinion being preferably half the number of teeth on the circular disc.

Each burner will then alternately receive an amount of gas corresponding to a complete revolution of the pointer, as, owing to the arrangement of the ports and the ratio of the gearing, the ports communicating with the measured gas register with those communicating to the burner during half-a-revolution of the circular disc.

Bye-passes are connected to the burners in such a manner that when gas is passing to a certain burner its bye-pass pilot is extinguished. One method of effecting this is for the pipe connecting the valve with the burner K to be tapped and gas led to the pilot-jet L¹, by the bye-pass N, so that when the burner is lighted its pilot-jet L¹ is also lighted; and similarly the burner K¹, and the pilot-jet L, will be lighted at the same time.

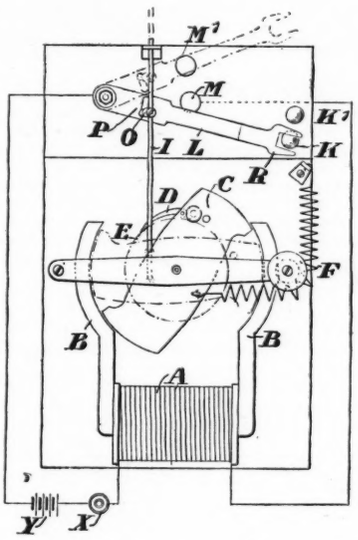
Automatic Lighting and Extinction of Gas-Jets.—Testor, F., of Stockholm. No. 24,783; Nov. 15, 1904.

This invention relates to automatic apparatus operating in such a manner that one or more gas-jets can be lighted by pressing a button, and extinguished after the elapse of a predetermined time.

The automatic device for electric stair-lighting, as in use pretty generally in Continental "flat" houses, chiefly consists of an electro-

magnet armature connected partly with clockwork or other check-mechanism (controlling the duration of its motion) and partly with a switch in the illuminating circuit. On closing the circuit of the electro-magnet, the armature will be set in motion, and the position of the switch changed so as to close the illuminating circuit and light the lamps. Thereupon the armature gradually returns to its position of rest, and returns the switch into such a position as to break the illuminating circuit and cause the extinction of the lamps.

This device, according to the present invention, is also applicable to gas-lighting, if the cocks of the gas-burners be arranged to turn on or shut off the gas by means of an electric current. In the form of apparatus illustrated, only one of the circuits is shown; whereas the gas-burners (which may be of any construction if only so made that the gas can be turned on and shut off by opening and closing an electric circuit) are not shown. The ignition proper can be done by means of a pilot-jet, an electric spark, or a wire or the like brought to incandescence by an electric current.



A is the electro-magnet; B, its poles; and C, an oscillating armature carrying a pawl D actuating a rachet E, which is combined with clock-work or check-mechanism. F is a spring operating for returning the armature to its position of rest (indicated by full lines). The armature is connected with a rod I, which acts upon a lever L, by means of a gudgeon O, resting in a slot P in the lever. The lever is bifurcated at its outer end R, which is insulated from the other part of the lever, and in its travel moves over two contacts K and K¹. The inner part of the lever also passes over two other contacts M and M¹.

The contact M is in electrical connection with one end of the coil of the electro-magnet; the other end being connected to a contact-button X in the circuit of the battery Y, which is also connected to the inner part of the lever. The contact M¹ is in electrical connection with the device for turning on the gas—also connected to the battery. The contact K¹ is in electrical connection with a device for shutting off the gas, placed in the circuit containing the battery, to which also the contact K is connected.

On pressing the button X, the battery circuit is closed through the lever L, which in its normal position rests against the contact M. The electro-magnet becomes energized, and its armature E is turned into the position shown in dotted lines. The rod I is lifted, thereby turning the lever L to the position shown in dotted lines, against the contact M¹. The circuit containing the device for turning on the gas is thus closed; the device is put in action; and the out-flowing gas is lighted by means of a pilot-jet.

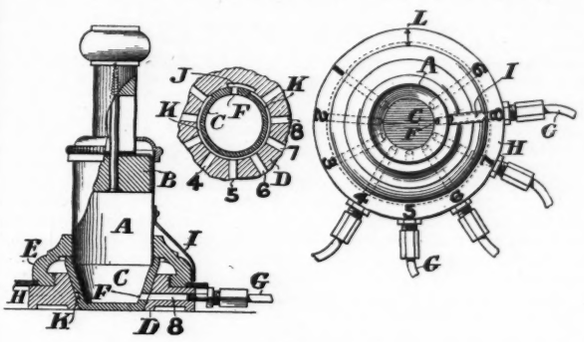
Should the ignition be effected by an electric spark, a separate circuit will be required for producing it, in which case the arrangement should be such that the lever L can be swung past the contact M¹ and to another contact (not shown), thus closing a circuit for the ignition proper.

The armature is gradually returned, through the action of the spring F, to its original position, after a period depending on the check-motion. The rod I is thus lowered and the lever is turned, breaking the circuit containing the device for turning on the gas. Near the end of the return movement of the lever, its bifurcated end R passes over the two contacts K and K¹; thus closing the circuit from the battery through the device for shutting off the gas. The gas is now extinguished, and the lever L resumes its original position, in which its outer end does not press against the contacts K and K¹, but its inner end presses against the contact M.

Operating Gas-Taps.—Luson, T. G., of Blackheath, S.E. No. 848; Jan. 16, 1905.

There has recently been introduced, says the patentee, for the purpose of operating gas-valves from a distance, a pneumatic apparatus consisting of a small cylinder and piston communicating by means of a flue pipe with the valve to be operated, which valve is specially designed to work on the impulse of the air moved by the piston in the cylinder. Hitherto in such apparatus each valve had to be operated by its own separate pneumatic device. But in the present invention a single pneumatic device is used, by means of which a number of valves may be operated severally or simultaneously as may be desired.

A is a pneumatic cylinder, and B the piston working therein in the usual manner. C is an extension of the cylinder forming a plug fitting snugly in the casing D. E is a ring screwed on to the casing to hold the parts together. In the extension C is a hole F, and also a circumferential groove K; and in the casing are a number of radial passages 1 to 9 and a recess J. The passages 1, 2, 3, and 9 are supposed to be plugged —not being in use; but 4, 5, 6, 7, and 8 are fitted each to a fine pipe G



leading to a gas-valve capable of being operated pneumatically. H is an annular plate which carries the numbers of the passages, and is held in position beneath the ring E. I is a pointer placed opposite the hole F of the cylinder extension, which hole is brought into line with one or other of the passages leading to the gas-valves or with the recess J by rotating the cylinder in the casing. The pointer I enables the attendant to open any passage by rotating the cylinder to the desired position, and thus operate any selected valve by means of the piston of the pneumatic apparatus.

To enable all the passages to be opened simultaneously, the cylinder is turned to the position shown in the detail; so that the pointer is opposite the mark L on the ring H. In this position, the groove K, which connects with all the holes 1 to 9, overlaps the end of the groove J, and the hole F is opposite the groove whence the air from the cylinder will pass by the groove K to all the pipes 1 to 9 simultaneously.

Turning On and Electrically Lighting-up Gas-Lamps whose Burners are Beyond Reach of Hand.—Pare, W., of West Bridgford. No. 1762; Jan. 30, 1905.

This invention relates to gas-lamps, either high up out of reach, or a distance away from the operator; and it comprises means for electrically turning them on and off and for lighting them up, somewhat on the lines of an arrangement of the some patentee described in the "JOURNAL" for Oct. 17, p. 182.

In his present specification, he remarks that it is a well-known arrangement to provide the cock controlling the gas supply so as to always operate in one direction from the action of an electro-magnet and a one-way clutch; and it is also known to provide sparking circuits to be closed for lighting up the gas at the burner after being turned on. But his present proposal is to have a tap and a one-way clutch mechanism for operating it, controlled by the action of a solenoid and the weight of its core and the weight of the clutch mechanism. The use of the solenoid is said to provide reliable means for turning the gas on and off, gives considerable power, and permits of a long range of movement, whereby the tap can be turned a quarter-turn for every operation. The tap can, by the use of the solenoid, be a tightly fitting plug one, as a solenoid gives sufficient movement and power to turn it. Further, in combination with the solenoid, the sparking circuit is arranged to be simultaneously closed by the same key that closes the solenoid circuit.

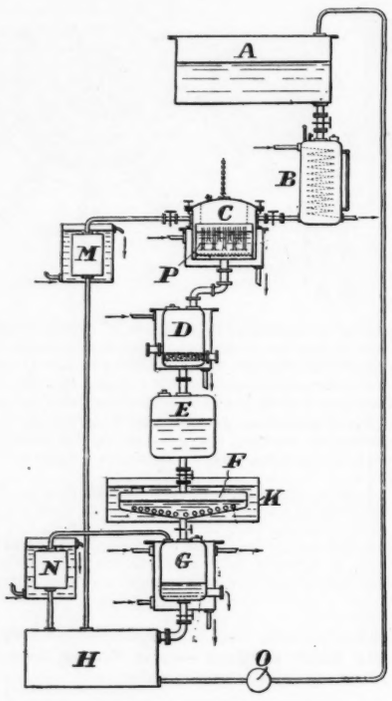
Treatment of Gas-Purifying Materials for the Recovery of Useful Products.—Becigneul, J. J. M., of Nantes, France. No. 8530; April 20, 1905. Date claimed under International Convention, July 23, 1904.

This invention has "been devised with the object of extracting the sulphur from spent gas-purifying materials and of recovering it in a condition of great purity; the spent purifying material being at the same time so completely desulphurized that it can be subjected to hot treatment with lime in a closed vessel, so as to immediately yield ferro-cyanide of lime."

The spent purifying material is submitted, in the condition of rest, to successive washing with toluene, heated to between 100° and 110° C. The solvent thus circulated through the materials to be desulphurized dissolves out and carries away the sulphur. The spent purifying material contains a large quantity of tarry products, which are partly dissolved and carried along with the solvent employed for the treatment; so that the sulphur-charged solvent is strongly coloured with these tars. In order to remove the tarry matters and to ensure that the sulphur, when finally recovered, shall be pure and of good colour, the sulphur-laden solvent, while still hot, is caused to percolate through a filter of animal charcoal. It leaves the filter in a clear condition and still containing the sulphur in solution; the tars being deposited in the carbon of the filter, from which they can be readily removed by distillation. The sulphur is subsequently precipitated from the clear solution by cooling. The precipitated sulphur, charged with solvent, can be then subjected to simple volatilization, so as to separate it from the solvent, which is evaporated off and condensed—the sulphur remaining as "an impalpable powder of great purity, and not presenting the dirty yellow appearance, which is a sign of contamination by tarry matters." The solvent with which the purifying materials remain impregnated at the end of the treatment is also removed by evaporation.

The main idea upon which the invention is based will be understood

from the foregoing explanation, says the patentee. The purifying materials, which contain cyanides, sulphur, and tarry matters in large quantity, are treated by the hot toluene, which dissolves and carries away the sulphur, leaving the cyanides intact, but becoming charged with a small quantity of tarry matters which are separated by filtering hot through animal charcoal as described.



The toluene employed as the solvent for the sulphur is contained in an upper vessel A, from which it descends into a boiler or heater B, in which it is raised to about 100° C. by steam or hot water. From the boiler the solvent passes into an "autoclave" C, the lower part of which is surrounded by a jacket through which steam or hot water can be circulated. A basket P is disposed in the autoclave for the reception of the materials to be treated, which rest on filtering cloths forming a false bottom to the basket, and serving to retain the solid and pulverulent materials which would tend to be carried on with the liquid solvent after it has exerted its action on the materials in the basket.

The bottom of the autoclave is connected with the filtering vessel D, which is likewise provided with a jacket for the circulation of steam or hot water. This vessel is fitted at the bottom with wire gauze diaphragms, upon which is placed a bed of animal charcoal.

The hot solvent containing the sulphur extracted in the autoclave and charged with a quantity of tarry matters, passes into the filter D, where a two-fold action occurs—that is, the sulphur is purified and the solvent is deprived of the tarry matters and other impurities with which it is contaminated. "The solvent is so efficiently freed from the tarry matters by the animal charcoal that it can be immediately re-utilized and passed continuously through the material under treatment—the operation is thus continuous, and forms an economical and practical process; the cycle of circulation of the solvent being complete."

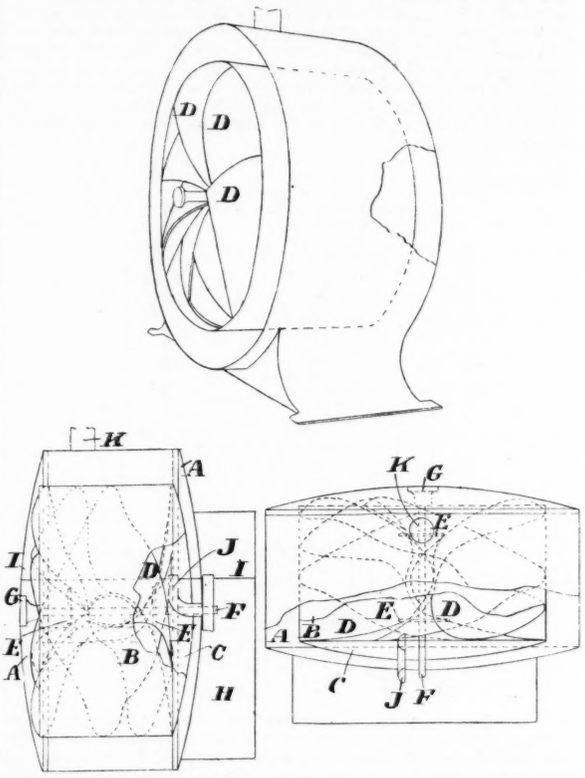
From the filter the solvent, now only containing sulphur in solution, passes to a reservoir E, and thence into a cooler F. This may consist of a closed chamber surrounded by water contained in a tank K. In the interior of the cooler a coil may be arranged, through which suitable cold liquid can be circulated. Under the cooling action, the sulphur is deposited; and when the solvent is passed from the cooler to the filter G, it carries the sulphur with it in a pulverulent condition. A strainer is fitted in the filter and serves to arrest the sulphur, while the liquid separated from it passes on to the reservoir H.

The filter is provided with a jacket through which cold water or steam can be circulated as desired. By circulating cold water through the jacket, the temperature of the solvent containing the sulphur in suspension in the filter can be further reduced, so as to cause the sulphur to separate completely from the liquid; while by circulating steam or hot water throngh the jacket the sulphur deposited upon the filter can be heated after the liquid has been collected in the reservoir, so as to drive off the solvent with which the sulphur is impregnated. The vapour thus produced passes away to the cold water condenser N, and the liquid solvent collected in the condenser passes to the reservoir H.

At the end of the treatment, the materials in the autoclave C are freed from the solvent with which they are impregnated. With this object recourse may first be had to a mechanical action—for example, by applying pressure in the upper part of the autoclave or by creating suction below it, so as to extract a large portion of the solvent which the material contains. Steam or hot water is then circulated through the jacket of the autoclave, and the remaining solvent is vaporized and passes off to the cold-water condenser M, from which the condensed solvent descends to the common reservoir H. The liquid solvent is raised from the reservoir H to the reservoir A by the pump O, and the cycle of operations may recommence.

Gas-Meters.—Léon, J. B., of Marseilles. No. 14,960; July 20, 1905.

The patentee claims a fly-wheel for gas-meters comprising six wings or arms of helicoidal form in both directions and without any angles or straight lines, secured by their periphery to a cylindrical casing and communicating with one another at the centre; the wings or arms being separated one from another towards their axis and approached to one another at their periphery, and attached towards their centre at one point only to two discs mounted on a solid shaft.



The fly-wheel referred to is composed of a cylindrical casing B closed at one side by a dish or cover C. In the interior of the casing six helicoidal wings D are soldered, forming six tight chambers, only communicating with one another at the centre. Two washers E, fixed to a shaft F, are soldered, at one point only, to the wings, in order to support them and connect them with the shaft. One of the ends of the shaft rests on a support G soldered to the casing, and the other end ends in a square chamber H on the front of the meter, where it is connected with the recording mechanism.

The fly-wheel is immersed in water up to the level line I I; and the gas arriving by the pipe J is introduced successively into the six chambers formed by the helicoidal wings, which alternately fill and empty in consequence of the rotation of the fly-wheel. The gas escapes by the pipe K.

The absolutely helicoidal form of the wings, and their being without any angle, has for its object, says the patentee, to facilitate the introduction of the gas; and the object of having six in number is to make the movement regular and increase the speed of rotation of the fly-wheel—"the result being to considerably increase the discharge of gas, which is almost three times as much as that of apparatus of the same dimensions hitherto employed."

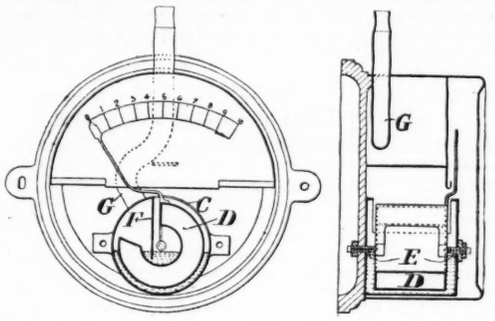
Apparatus for Measuring Differences in the Pressure of Gases.—Berger, E. L., of Halmstad, Sweden. No. 10,176; May 15, 1905.

This apparatus for measuring and indicating the difference of pressure of two gases, or of the same gas in different parts of a conduit, is particularly intended for measuring the draught in furnaces and the like for controlling the quantity of air supplied.

The casing (p. 759) has a glass at the front, admitting of access of air to the interior, which consists of a partially open liquid-container C, attached to a plate B and enclosing a covered plate D, which may be double-walled, and is suspended on pins or points E in such a manner that it can be turned. The liquid-container is divided by a partition F or the like extending down into the liquid and preventing communication between the two compartments of the container, one of which is connected by a tube G with the smoke-flue, for instance. The rotatable plate or body D is provided with two end surfaces on which the different pressures act in such a manner as to turn the body, which, moreover, is so shaped and suspended that the greater portion of it normally falls within the part of the container C, which is not provided with the tube G; this portion of the plate being furnished with an index moving over a scale.

It is evident that, should the pressure in the outer compartment of the container C (which directly communicates with the air or some other gas) increase in comparison to that of the other one communicating with a smoke-flue or a gasholder or gas-conduit—or, in other words, should the draught increase when the apparatus is used as a draught-gauge, the higher pressure (that of the air) will turn the plate or body D, and the amount of the rotation may be read off on the

scale. The force resisting the rotation is that of gravitation, the action of which is proportional to the distance between the point of suspension and the centre of gravity of the body. By increasing the height



of the liquid above the centre of gravity of the body, the centre of gravity will be raised (the body not being wholly immersed in the liquid) and the distance between it and the point of suspension decreased; so that the torque due to gravitation becomes smaller, and the deflection greater, for a given action.

By this means it is possible, says the patentee, by changing the level of the liquid in the container C and using several different scales or calibrations, to employ the same apparatus for measuring the differences of pressure within comparatively wide limits, and still obtain large and easily-read indications even with small differences of pressure.

APPLICATIONS FOR LETTERS PATENT.

24,443.—HUTCHINS, T. W. S., and WILKIE, J. B., "Gas-producer." Nov. 27.
24,456.—HELPS, G., "Bunsen-burners." Nov. 27.
24,457.—HELPS, G., "Inverted-globe attachments." Nov. 27.
24,475.—ANDERSON, W. & H., "Suspending inverted globes." Nov. 27.
24,503.—OTTO HILGENSTOCK COKE-OVEN COMPANY, LTD., "Improvements in carbonizing coal for increasing the yield of ammonia." A communication from C. Otto and Co., G. m. b. H. Nov. 27.
24,510.—PAYN, J. A., MICHELL, J., and MOWBRAY, C. E., "Gas-engines." Nov. 27.
24,521.—CLARK, D. J., "Mantle-hangers." Nov. 27.
24,522.—CLARK, D. J., "Mantles." Nov. 27.
24,533.—KING, M., and JAMES, J. E., "Coin meters." Nov. 27.
24,561.—BARDSLEY, F., "Anti-vibrator." Nov. 28.
24,584.—HENZE, A., "Inverted mantles." Nov. 28.
24,623.—THOMPSON, W. P., "Gas-lamps." A communication from the M'Lewee Gas-Lamp Manufacturing Company. Nov. 28.
24,634.—STILL, W. M., and ADAMSON, A. G., "Mantles." Nov. 28.
24,637.—GRANT, R. E., "Acetylene apparatus." Nov. 28.
24,651.—SHOOB, I., "Incandescent burners." Nov. 28.
24,663.—MEALING, W. R., "Seal-locks." Nov. 29.
24,678.—BOWMAN, H., and SOUTHWORTH, J. T., "Gas-generators." Nov. 29.
24,680.—VRIESLAND, A. I. VAN, "Mantles." Nov. 29.
24,720.—SUTCLIFFE, L., "Gas-fittings." Nov. 29.
24,730.—RIDLEY, T. W., "Endless conveyors." Nov. 29.
24,760.—SUMMERSON, R., "Non-lighting-back devices." Nov. 30.
24,786.—WILKINSON, J., "Producing and utilizing mixtures of coal gas and air." Nov. 30.
24,815.—THE NEW INVERTED INCANDESCENT GAS-LAMP COMPANY, LTD., and BRIDGER, J., "Inverted burners." Nov. 30.
24,828.—CARPENTER, C. C., "Burner for testing gas." Nov. 30.
24,838.—SAWARD, W., and ASTLEY, J., "Gas-producers." Nov. 30.
24,859.—POLESCHOWSKY, J., and BARR, H., "Inverted burners." Nov. 30.
24,899.—GADD, W., and MASON, W. F., "Columnless gasholders supported by spiral guides." Dec. 1.
24,925.—DAVIES, R., "Stokers' gloves." Dec. 1.
24,940.—LADD, J. H., "Gas-furnaces." Dec. 1.
24,949.—LAKE, H. H., "Mantles." A communication from Deutsche Gasglühlicht, Akt. Ges. (Auerges). Dec. 1.
25,045.—HECKERT, G. A., "Introduction of steam or gas into a gas-retort." Dec. 2.
25,046.—M'RAE, J., and INGRAM, H., "Manufacture of acetylene." Dec. 2.
25,056.—ALBERTIS, C. DE, "Gas-burners." Dec. 2.

Chard Gas Company's Arbitration Costs.—The Deputy Town Clerk of Chard (Mr. J. A. Forward) has presented a report to the Council with regard to the taxing of the costs of the Gas Company in the matter of the arbitration proceedings in connection with the purchase of the works by the Corporation. In doing so, he pointed out that the Company's bill amounted to £1382; but he had succeeded in getting £582 taxed off, thus reducing the cost to £800.

Newport Municipal Undertakings and Non-Payment of Rates.—The Newport (Mon.) Ratepayers' Association have issued a circular in which they criticize the financial proposals of the Bill the Corporation are promoting. Two of the matters to which the Association object are the suggested mixing up of the capital and revenue accounts of the electricity and tramway undertakings and the conferring of exemption in the matter of the payment of rates. They point out that the latter clause would enable the Corporation to excuse all their own works and undertakings from the payment of rates, while seeking to compete in every way with the heavily rated business concerns in the borough.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

The New Gas-Testing Burner.

SIR,—I have noted with interest your editorial references to the new testing argand, and think you are under a little misapprehension as to the "Wandsworth" burner.

Mr. Carpenter's patent specification, as published in the "JOURNAL" for Oct. 17, most clearly shows a 24-hole burner and not 15 elongated holes—this being a distinctive feature of the "Wandsworth" argand. This burner simply fitted with Mr. Carpenter's screw-disc is worse than useless in securing the desired end—namely, maximum and uniform results for all gases of varying composition.

I have long since shown that even the "London" argand was useless; and so late as June last I stated, at the meeting of the Institution of Gas Engineers, that it would never answer the purpose of testing all gases fairly. My 1905 pattern is the only argand burner in existence that will develop the maximum light of any gas made from 60 candles downwards; while the maximum capability of the new burner is about 18 candles. To consume gas at a fixed rate is not a scientific, rational, or commercial method. Expecting at all times to get maximum illuminating value is to invite failure, even with such a screw-disc air-adjuster.

I have seen one burner made according to the specification, and find that it is my burner with the head of the central peg replaced by the screw-threaded plate or disc at the under part of the burner. The only difference necessary was the addition of more metal to the underside of the gallery, so as to bring the main external-air inlet in a line with the central one, so that Mr. Carpenter's "dished" plate might have effect.

While I do not wish to disparage any credit due to Mr. Carpenter, I feel justified in pointing out there is no novelty in this method of regulating air to a burner. I adopted six to seven years ago the same method of regulating air to a gas-furnace, and for some years Messrs. Townson and Mercer have made and sold a bunsen burner with precisely the same thing as used by Mr. Carpenter. Then, again, it was in a modified form Sir Frederick Bramwell regulated the air to the central way of the "London" argand; but with slight success.

The means now used on the new testing-burner are fairly effective; but you can never rely upon the result, and time alone will prove the truth of this remark. Therefore I strongly urge the adoption, in new Acts, of a varying rate of consumption in my burner, or any better one, using a length of flame 1 inch less than the length of the chimney employed, in order to achieve the maximum light and uniformity for all gases—preferably a 6-inch chimney for all common gas.

Again, on p. 672, it is further advanced that the three grades of gas supplied in London will be tested "under identical conditions" in the same burner and the same chimney. This—however desirable—is not the case, because the flexibility of the new burner is such that 16-candle gas will be underrated to a greater extent than 14-candle gas, unless the Gas Referees prescribe limits of regulation for the lower qualities. By this, 16-candle gas will require full air, with but little regulation; whereas for 14-candle coal gas, the air must be toned down to equal a reduction of 0·6 cubic foot of gas, and the 14-candle mixture equal to 0·8 cubic foot of gas, in order to preserve the air ratio between the 16-candle mixed, the 14-candle coal, and the 14-candle mixed gas.

If no limit be prescribed, then how is the Gas Examiner to know when using the burner that the result he obtains at 5 cubic feet is "the greatest amount of light" capable of being developed from the gas under examination? This equally applies, even if limits of regulation are fixed—to say nothing about the photometer and its effect.

One might well exclaim, "Oh, that absurd 5 cubic feet method!" I wonder what an intending gas consumer would say if the purveyors stipulated that he must only burn 5 cubic feet per hour in all his burners. One thing I feel certain of. He would go in for electric light or use oil, because of the freedom from all restrictions. Gas companies impose no such restrictions upon their consumers; and in return no fixed amount should be imposed upon them.

East Ham, Dec. 8, 1905. W. GRAFTON.

The New London Testing Burner and Its Probable Adoption in the Provinces.

SIR,—I observe, with interest, that the announcement is now made of the adoption by the Metropolitan Gas Referees of Mr. Carpenter's "Metropolitan Argand Burner No. 2" for official tests upon the gas of the three London Gas Companies.

No doubt, as in former cases, Provincial Gas Companies will (after due consideration) adopt the same burner for their official tests as will now be used in London; and it will be necessary to obtain sanction to make this change.

If any such steps are taken, I hold the opinion that this will be a suitable opportunity to apply at the same time for powers to insert definite and satisfactory general testing clauses in place of relying (as is now too often the case) upon references not only to previous Local Acts, but also to the Gas-Works Clauses Act, with its model of antiquity—Schedule A—which deals with testing. The clauses, too, dealing with the appointments and powers of gas examiners require considerable overhauling.

I suggest that, seeing there is in existence a body, the "Gas Companies' Protection Association," who so far recognize their obligations as to be at the present moment the promoters, in general gas interests, of the "Gas Companies' (Removal of Sulphur) Bill," this body should take steps to frame, and endeavour to secure the adoption of, a general testing clause, which will be modern and satisfactory not only to manufacturers of gas, but to local authorities, and above all, to gas consumers, who, after all, are those most interested.

Fountain Court, Temple, E.C., Dec. 9, 1905. JACQUES ABADY.

Removal of Naphthalene from Coal Gas.

SIR,—Permit me, before dealing with Mr. Colson's letter, to refer briefly to your editorial comment anent mine in your issue of the 28th ult. You were mistaken in supposing I was either perturbed or irritated when my previous letter on this subject was penned. It appeared to me desirable to draw attention to what seemed, and which I still think is, a decidedly exaggerated statement that the extraordinarily large sum of £12,000 saved per annum being effected at Leicester was due to the removal of naphthalene, and to which exaggeration the "JOURNAL" had lent countenance and support. In addition I desired to point out that the Leicester process is practically only a part of the Derby naphthalene process.

Mr. Colson gives the decrease in receipts for gas and residuals for the half year under review in detail, which amount to £10,708; but surely against this sum should be set the decrease in expenditure upon the undermentioned items—

Coals	£6,259
Oil and coke for carburetted water gas	813
Carbonizing wages	2,413
Repairs and maintenance	2,002
Total decrease in expenditure	£11,487

In common with most towns—owing chiefly to the unusually mild weather in the early part of the year—there was a decrease in the consumption of gas at Leicester during the first six months of this year. Hence less coals would require to be carbonized, with a c rresponding reduction in the residuals therefrom, together with the lower prices prevailing for coke and tar products. However, fortunately, along with this decrease in the value of two important residual products, gas coals (especially in the Midlands) were easier in price; the reduction in one case being somewhere about 8d. per ton of coal carbonized. The result (along with the less quantity used, as in the case of Leicester, owing to the decrease in the sale of gas) was that for the half year ended June 30 last the decrease in money value obtained for the residual products was balanced, within £409, by this decrease in the cost of coals.

Further, the gross profit at Derby for the first half of this year—notwithstanding a decrease in the gas-rental of over £800—was upwards of £1000 more than for the corresponding period of last year. This in our case could not possibly be due to naphthalene removal, as fortunately, owing to the introduction of the Derby process, we were practically free the whole of the previous year.

It appears to me that more definite proof will have to be forthcoming before such huge alleged savings on this score can be accepted.

I now turn to Mr. Colson's analysis of the Derby and Leicester solvents; and so that your readers may judge as to the similarity of the two, I give my analysis, which differs in some respects from the figures given by Mr. Colson. It should be borne in mind that both solvents are distillates from coal tar obtained in a very similar manner.

Analysis of Naphthalene Solvents.

—	Sp. Gr. at 15·5° C. Water 1·000.	First Drop.	Percentage by Volume of the Distillates.					Solid Matter at 40° Fahr.	Naphthalene absorbed per 100 c.c. at 15·5° C.
			160° to 170° C.	170° to 180° C.	180° to 190° C.	190° to 215° C.	Residue.		
									Grs.
Derby . .	0·910	130°	55	23½	12½	5	4	5	26
Leicester .	0·980	128°	27	20	13	36*	4	26	10

* Contained over 20 per cent. of naphthalene.

It will be seen that the Leicester solvent contains no less than 60 per cent. of distillates which are identical with those of the Derby solvent; and the remaining 36 per cent. is of little value for naphthalene removal on account of the high percentage it contains before use.

I again allege that the success of the Leicester solvent is due almost solely to those distillates which are a part of the Derby solvent.

The length of this letter precludes me from dealing with the other questions raised by Mr. Colson; and I hope, with your permission, to do so next week.

Derby, Dec. 9, 1905. J. FERGUSON BELL.

The Naphthalene Trouble.

SIR,—As an ex-gas manager, and one who has taken up residence in a town where the naphthalene bugbear is still in evidence—and has been for years past—and where one sees daily numbers of gas workmen parading the streets shouldering the force pumps (one would think they were engaged to advertise a certain make of pump), I read with interest and satisfaction Mr. Colson's letter in your last issue. I was thankful to see a cure had at last been found; and he, indeed, must now be a happy man.

I am afraid some undertakings can present even a worse picture than Mr. Colson portrayed in his first example; and they do not always possess the "patient Committee" stated, as some officials know to their cost. Committee-men and directors are apt to think the staff is somewhat to blame, and endeavour to fix the responsibility for the numerous complaints on their shoulders, instead of on the real cause—especially if some of the unsuccessful patentees of the numerous "cures" should report that the complaints are due to other things, which I have known to be the case.

Is it not the first and foremost duty of responsible officials, in these days of keen competition, to bring to the notice of their directors and committee-men—if these gentlemen do not read the gas periodicals—the successful results obtained in other towns, and get them to instal a process which is known to effect a cure, and thus relieve their long-suffering consumers? I believe several systems have been tried in the town where I now reside, and services enlarged—much beyond any possible requirements—but without avail.

Mr. Colson's second picture presented—although coloury—is none too startling if his cure is as effectual as it appears to be according to the working and financial results obtained, and, indeed, "Life must now be worth living" to him and his staff.

Dec. 9, 1905. SUFFERER.

Laying Gas-Pipes Under Footways.

SIR,—There is some little friction here with the Town Council and ourselves as to the interpretation of the Gas-Works Clauses Act, 1847, respecting the laying of main-pipes and services. Clause 6 sanctions the laying of mains under pavements or roadways, subject to superintendence; clause 8 provides for three days' notice in writing; and clause 9 refers to superintendence. Doubtless all these clauses are well known to many of your readers; and possibly some of them may have had a similar experience with local authorities to that which we are now having. I should be much indebted to anyone who will throw some light on the position a company has in this connection.

We have recently been called upon to lay about 800 yards of 2-inch service to a house, and, seeing that to lay it in the road would cost something like 15d. per yard more than laying it under the footway, we set out to lay it in this position. We were then asked for a plan by the Council, who referred us to clauses 8 to 12 in the 1847 Act. We replied that we could not see anything in these clauses that authorized the Council to prohibit our laying a pipe under a footway, nor could we admit that they were justified in asking for a plan. The Council followed the matter up, and threatened us with an injunction; and then I was instructed by my Directors to cease the work, and send in a plan for the Council's approval.

I am still not satisfied that the Council had any right to take up the position they did. The interpretation that I have always understood was to be put on the word "plan" in clause 9 of the Act has been—any form of words, or any form of words and lines, which will adequately or reasonably indicate the proposed position of the pipe in question for the purposes required. Thus a map, plan, or drawing may reasonably be required when it is proposed to lay a main-pipe several inches in diameter, which would not be considered necessary when a pipe of only 2 inches in diameter is in question.

Further, I have understood that no council could prevent the laying of pipes under footways; and that the only discretion left with the Justices under clause 9 was as to the *position* of the main in the footway or in the road.

I repeat, if any reader will help me I shall be obliged. I am taking counsel's opinion on the matter.

Nuneaton, Dec. 6, 1905. GEO. HELPS.

Price of Gas to Possible Users of Suction-Gas Plant.

SIR,—An address from Mr. Newbigging is always interesting, even though, as in the present case, one cannot agree with his views—for in his paper under the above title I think he has ventured upon a series of arguments and assertions which will not bear examination. At any rate, they are more or less in direct contradiction to the practice of men who are carrying on large business concerns, and who every day are compelled to vary their prices according to circumstances. I quite agree that one could not sell gas or anything else as a regular thing at a loss; but then the point is upon what estimate you are to base the loss. A transaction which, looked at from one point of view—and a theoretical point of view—is loss, may from another point of view more correctly be claimed as profit.

Take an illustration. A. B. is carrying on a business; and the total working expenses of carrying on such business amounts to (say) 10 per cent. of the turnover. A. B. has the option of an order for £100 worth of goods; but he finds that he must either be content with 5 per cent. profit or lose the order. Naturally, in ordinary circumstances, he quickly takes the order, and secures an actual profit of £5. In what way are the regular customers who are paying more than 10 per cent. profit for their goods damaged or prejudiced by this transaction? The 5 per cent. made goes to increase the total profit obtained from the business. It may be that the percentage of profit on the turnover is slightly less; but the aggregate is actually increased, and if A. B.'s customers were on the sliding-scale, they would be entitled to a proportionate decrease in price. And so I contend that, if we sell gas for power purposes at a price beyond what the actual cost of producing that gas is, we make a profit, and that profit is a help to the concern as a whole, and we shall the sooner be able to give a reduction to our lighting customers.

Let us glance at some of Mr. Newbigging's assertions. "You are supplying them" [your gas consumers] "at a sacrifice of the dividend, or some portion of it." "Why should the consumers of gas by night for lighting, and the consumers of gas both by night and by day for lighting and cooking, be saddled, and continue to be saddled, with all fixed expenses, and others be allowed to go scot-free?" "The price ceases to be reasonable to the ordinary consumers whenever another obtains a supply at a figure that does not pay its way to the last penny of dividend." All these assertions are made on the hypothesis that the gas is sold at less than cost price. Now, no one thinks of such a thing, and no one does such a thing. The profit may be less than it should be; but if there is any profit at all beyond the cost of the extra gas in the holder, that profit goes to assist all the other consumers. Mr. Newbigging's contention amounts to this—that there is no profit on any transaction until you have provided for every charge and for dividend; and this must be done on every transaction. But in the case of a gas undertaking, all these charges are provided for and already met; and additional business that can be obtained at a profit beyond cost *is* profit, and goes to swell the profits of the concern.

Mr. Newbigging advises that we should let the power consumers leave us. I agree with your remarks, Sir, that if we once lose these people there will be little hope of getting them back again. The one who indulges in the counsel of despair is not the manager who agrees to the lower price, but Mr. Newbigging himself, who would "throw up

the sponge" without a struggle. But, further, gas for lighting purposes has certain advantages of which we are entitled to make the best use. In gas for power purposes, our advantages are not so decided; and we must recognize the fact as people do in all kinds of trades, and act according to the special circumstances.

Such are my views; and, being in accordance with actual practice in almost every other business, they will perhaps meet with general approval.

Matlock, Dec. 8, 1905. ROBERT HALL.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* BUCKLEY.)

Thursday, Dec. 7.

New Inverted Incandescent Gas-Lamp Company v. Cope and Timmins, Limited.

On the hearing of this case, commenced on the 30th ult. (*ante*, p. 691), being resumed to-day,

Professor *Lewes* was recalled and further cross-examined by Mr. WALTER. He was taken in detail through the various alleged anticipations—viz., Clamond (No. 60 of 1891), Schott (No. 8509 of 1896), Kent (No. 3667 of 1897), Henze and Barg (No. 24,103 of 1898), Beese (No. 23,169 of 1899), and Lewis (No. 1403 of 1882). These, witness said, did not produce a commercially successful burner. In the defendants' burner, the arrangement was such that the outside shaft was not kept cool.

In re-examination by Mr. MOULTON, witness said he was acquainted with most of the efforts which had been made to introduce new forms of lamps. It was perfectly obvious that among the many alleged anticipations there had been several attempts to have inverted burners. Prior to Bernt and Cervenka's specification, he had never known a practically successful inverted burner. These burners had been one of the greatest successes of the day since the introduction of mantles; and they were also economically a success. A skilled person would have no difficulty in making a commercially successful inverted burner by following Bernt and Cervenka's instructions. Until the date of this specification, regenerative burners with mantles had not been a success. Kent got nearer to solving the problem than any of the other inventors. There was nothing in his specification which would enable anyone to make an inverted incandescent burner with a bunsen burner. Plaintiffs' burner, fitted with an ordinary Welsbach mantle, was a successful lighting appliance.

Mr. *J. Bridger*, examined by Mr. GORDON, said he was the General Manager of the plaintiff Company. Bernt and Cervenka's burner was first put on the English market as a commercial article in the spring of 1903, but it was in use in Austria early the preceding year. Precisely the same form of mantle was used then, but the attachment was different. When put on the English market, the top china plate was omitted. The alterations were dictated solely by economy in the cost of manufacture. The burner had been a complete success; the sales since March, 1903, up to the present time amounting to 513,099. Between April and September, 1904, the sales were 59,655; and between the corresponding months this year, 112,453. There was no difficulty in fitting the burner to an ordinary gas supply.

Cross-examined: Bernt and Cervenka were the apostles of coolness. There was great merit in keeping the air and gas cool. Plaintiffs were the owners of the Farkas patent; but they had not put on the market any lamps made under it. The shaping of the mantle to the flame was not a matter of great importance. Witness was the inventor of an arrangement for attaching the mantle to a ceramic ring.

Mr. *W. H. Y. Webber* said the first successful inverted incandescent gas-burner with which he was acquainted was that of Bernt and Cervenka. Previous to this invention, attempts had been made for many years to solve the problem of inverted incandescent gas-lamps. Since reading Bernt and Cervenka's specification, he had come to the conclusion that the cause of failure was that they all proceeded on the principle of regeneration. It was necessary to break away from this principle in order to get a successful burner of this type. Bernt and Cervenka's specification conveyed new and useful information, and was sufficient to enable a person to make the lamp.

In cross-examination, witness said he also was an apostle of cool air and gas.

This was the case for the plaintiffs.

Mr. WALTER, in opening defendants' case, said he could only liken the plaintiffs to persons who had burnt their boats and were trying to live on the flotsam and jetsam which arose. If the burner was made in the approved form, as described in the specification, with an isolator and a shaft of some non-conducting material, the patent might be supported; but it could not be if the word "isolator" meant what the plaintiffs said it did mean—a mere metal tube forming a continuous shaft from the mixing-chamber to the burner-head. If the patent included a metal tube, which was a conductor of heat, it could not be supported. By no stretch of the imagination could the defendants' burner be said to be an infringement, any more than the Globe burner, which Mr. Justice Joyce had held did not infringe. At the date of the patent, inverted burners were common, as were also bunsen burners; and all that the patentees claimed here was "an improved form of bunsen burner." What the improvement consisted of, however, was nowhere stated. If the "isolator" meant merely a metal tube, then the defendants had done only what was done so far back as 1897 by Kent.

Friday, Dec. 8.

On the hearing being resumed this morning,

Mr. *James Swinburne*, examined by Mr. WALTER, said he had carefully read Bernt and Cervenka's specification, and, so far as he could gather, looking at it as an engineer, the invention was to prevent the flame with a bunsen burner lapping back; and they arranged the down draughts accordingly. No doubt the inventors thought this was prevented by the gases in the shank getting hot; and to obviate this difficulty, they constructed it of some non-conducting material. In the defendants' lamp there was nothing which isolated the shaft down which the mixture of air and gas was passing. With or without an outer cover, there was nothing which isolated the heat from passing from the bottom of the burner to the mixing-chamber. The earthenware hood at the top acted to baffle the upward currents of air; but it had no cooling effect. Defendants' burner did not in any way correspond with that of the plaintiffs. Farkas had the same idea of keeping the shank cool; and for this purpose he used an outer tube. In the ordinary "C" incandescent burner, the plate at the bottom prevented the explosion from sending hot gases down outside the burner, and causing an ignition where the mixture took place. The effect of the explosion was not to cause the gas and air to be driven down the inside tube, and to be blown out of the little holes and be ignited. In order that there should be ignition, it was necessary that the flame should travel down outside. Bunsen burners with various sized heads were well known at the date of the plaintiffs' patent. In both the Rawson and Clamond specifications, provision was made for preventing the products of combustion mixing with the incoming air. In the year 1900, no invention was required to tell people not to mix the products of combustion in a bunsen burner. Schodt's specification accurately described a bunsen burner. An engineer would have no difficulty in making an inverted lamp if he worked according to Kent's patent. There was no value in keeping the tube of an inverted bunsen burner cool; in fact, he had seen such a burner heated till it was red hot.

In cross-examination by Mr. GORDON, witness said that if the passages were kept cool, there was a theoretical advantage to be obtained in working the lamp. The object of Bernt and Cervenka was to keep the shank or shaft cool, and also the passages through which the air and gas passed. He did not suggest that any successful inverted incandescent burner was on the market before the date of the plaintiffs' patent. No doubt Bernt and Cervenka were the first to introduce an inverted incandescent burner commercially. He could not say that there was a demand about this time for an inverted lamp; but there was a great opening for such a lamp, and inventors were applying their minds to the subject. If his reading of Bernt and Cervenka's specification was right, there had been no anticipation by other patentees. The imaginary problem which Bernt and Cervenka started to solve was not existent in Kent's patent. It was not necessary to keep the shank cool. The important thing, if it was important at all, was that the gas and air supply should be kept cool. Bernt and Cervenka proposed to effect this by means of an isolator and deflector. The latter answered two purposes—it drove away the convection currents, so that they did not heat the burner, and also protected the admission ports both from heat and deterioration. Provision was made in the patent for the insertion of the burner-head into the mantle, in order to make the flame fit the mantle. This idea was not shown in Kent's specification.

Saturday, Dec. 9.

Mr. *Swinburne* was further cross-examined to-day. He said a bad conducting material hindered the transmission of heat; and in the case of a hot body in contact with a cold one, the transmission of heat from the hot to the cold body was effected by the conductivity of the cold body. Among the 23 anticipations relied upon by the defendants, there were 15 for inverted incandescent burners. These inventors worked upon the idea of using a regenerative burner; but the principle was not useful for burners of this class. If there was any merit in departing from the regenerative, and going to the non-regenerative, system, and plaintiffs had been the first to do so, they were entitled to the credit for it. Witness was then taken at some length through the various alleged anticipations, and also the plaintiffs' patent; but his evidence-in-chief was not in any way shaken.

The further hearing was adjourned till to-morrow (Wednesday).

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* JOYCE.)

Wednesday, Dec. 6.

Attorney-General v. North-Eastern Railway Company—The Supply of Water to the Hull Docks.

To-day, his Lordship delivered his considered judgment in the above case, the hearing of which had occupied several days. The action was brought by the Attorney-General and the Corporation of Kingston-upon-Hull as relators, for a declaration that it was *ultra vires* for the defendants to supply the dock at Kingston-upon-Hull with water pumped or otherwise obtained from their land at Hessle, forming part of their railway undertaking, for any purpose connected with the dock, or to sell or supply water so obtained to any tenant occupying premises within the dock, or to any ship using the dock, or otherwise to carry on the business of a water company. The facts were as follows: The Corporation are the owners of the water-works under an Act obtained in 1897; and the limits within which they are authorized to sell and supply water are the city and county of Kingston-upon-Hull. Certain parts of the defendants' railway are within the city and county. There is also situated within the city and county the defendants' dock, which before 1893 formed part of the undertaking of the Hull Docks Company, which was incorporated by Special Act for the purpose of constructing and working the dock. By section 4 of the North-Eastern Railway (Hull Docks) Act, 1893, it was enacted that the two concerns—the railway and the dock—should be amalgamated into one, which should be the undertaking of the defendants. By section 7 it was provided that, notwithstanding the amalgamation, none of the provisions of the Acts relating to the Dock Company which, if the amalgamation had not taken place, would have applied exclusively to the undertaking of that Company,

or to the Company in respect thereof, should apply to any portion of the undertaking of the defendants other than the dock undertaking, or to the defendants in respect thereof; and, further, that none of the provisions relating to the Railway Company which, if the amalgamation had not taken place, would have applied exclusively to the railway should apply to the dock, or to the Company in respect thereof. Since the year 1893, the dock has been vested in, and worked by, the defendants. Before Sept. 15, 1903, all water required by the defendants or their tenants or the ships using the dock was supplied by the Corporation under their statutory powers. On the date named, the defendants closed the mains, and stopped the supply of water by the Corporation; and since that date they have supplied the dock and ships and their tenants with water obtained from wells or springs on their land at Hessle. The plaintiffs alleged that the defendants, by doing this, were carrying on the business of a water company, to their detriment; and they contended that there was no statutory justification for their doing so, and that the acts complained of were *ultra vires*. The defendants contended that they were entitled to use their land for any purpose not inconsistent with that for which it was acquired, and that the supplying of water was incidental to the carrying on of a dock.

Mr. DANCKWERTS, K.C., and Mr. R. J. PARKER appeared for the plaintiffs; Mr. NEVILLE, K.C., Mr. HUGHES, K.C., and Mr. W. GUTCH represented the defendants.

Justice JOYCE, in giving judgment, reviewed the facts of the case, as set forth above, and said the statement of claim asked, first, for a declaration that it was *ultra vires* for the defendants to supply their dock with water; and, secondly, for a declaration that it was illegal for them to carry on the business of a water company. Without going into details, he had come to the conclusion, on the evidence, that the defendants were not carrying on the business of a water company, or supplying water to any persons or for any purposes for which the Dock Company could not, if still in existence, have legally supplied water. In other words, the second part of the claim could not be sustained. It appeared to him that the real question in the action was whether the defendants were entitled to supply their dock with water obtained from their wells at Hessle, which were the property of the Railway Company before the acquisition by them of the dock and the amalgamation of the two undertakings. Of the water used in the dock, some was required for locomotives; and obviously all the water thus supplied and used was for the benefit of the railway traffic. On behalf of the Attorney-General, it was contended that though the defendants might be entitled to purchase water from the Corporation, or indeed from any person who had it to sell, all that which was required for the use of the dock the defendants were not entitled to take from property originally acquired for their railway. It was also argued that the defendants were not entitled to use any part of the railway property for any of the purposes of the dock. If this were correct, it would logically follow that if the defendants were to purchase water or electrical energy from anyone who might be able and willing to supply it to them at Hessle, it would be illegal for them to convey it by any pipe or wire along, or even across, the railway into the dock for use there, inasmuch as it would, according to the plaintiffs' argument, be using for dock purposes a portion of the site of the railway. This appeared to him to be a somewhat startling proposition, having regard to the fact of the amalgamation of the two undertakings. There was no suggestion that the defendants had infringed the rights of anyone. If they were transgressing any statutory prohibition, it was contained in the Act of 1893. After reading several sections of the Act, his Lordship said it had not been pointed out to him, and he had not been able to discover, how the defendants were precluded from doing what they were doing by reason of the non-application to the Dock Company of the provisions of the Railway Acts, which before the amalgamation related exclusively to the railway and the traffic thereon. The defendants must have fresh water at the docks, and they might undoubtedly purchase at Hessle, or anywhere else on their line, and convey it in tanks on trucks into the docks for consumption there. If they might convey water in tanks, could it not be more conveniently, and at less expense, carried by a pipe or pipes into the dock? His Lordship failed to see how what the Railway Company were doing was in any way *ultra vires*. The action must therefore be dismissed; and the plaintiffs would have to pay the costs.

LAMBETH COUNTY COURT.—Friday, Dec. 1.

(*Before His Honour Judge* EMDEN.)

Cressy v. South Metropolitan Gas Company.

In this case, the plaintiff claimed damages for injuries sustained through the alleged negligence of the defendants.

Mr. ABRAHAM appeared for the plaintiff; Mr. ROSTRON represented the defendants.

Mr. ABRAHAM, in opening the case, complained that his client, who was a poor woman, was the party between the Gas Company and the road authority, for both of whom a very important question was to be decided in this action. Mrs. Cressy had lived for eleven years with her husband at No. 63, York Street, Lambeth. In May, 1904, the Company connected their mains with No. 62 in the street; and on Feb. 11, 1905, when Mrs. Cressy was waiting in the evening on the kerb outside the house, she stepped into the carriageway, and, owing to a subsidence which had taken place where the mains had been connected, missed her footing, and fell heavily to the ground, spraining her ankle. She was taken to St. Thomas's Hospital, and was afterwards treated by a local medical man. She applied for compensation, to the road authority—the Lambeth Borough Council—who pleaded that they were not liable, and referred her to the Company, who, in turn, stated that if there was any liability it lay with the road authority. The Company pleaded, in defence, that they were protected by section 114 of the Metropolis Management Act. But this section only gave the Local Authority the option of doing the work in case they considered it expedient. Section 10 of the Company's Act clearly laid it down that they were to keep in repair for three months, or for such further time, not exceeding twelve months, as the soil which was broken up continued to subside, the roads and pavements they had disturbed.

Judge EMDEN: The point, though I recognize its importance, seems a very simple one.

Mr. ROSTRON: The case is complicated by the fact that the Borough Council, under the power given by section 114 of the Metropolis Management Act, undertook the reinstatement of the road which had been opened for our pipes.

Mrs. *Cressy* gave evidence in support of her claim, and stated that she was six weeks on crutches.

In cross-examination she said it was rather dark at the time of the occurrence, and she did not see the hole.

Medical testimony having been given in regard to the injury, which was not disputed,

Mr. *H. G. Pastene*, who made a survey of the scene of the accident and produced plans, stated that the hole was about 2 feet in diameter, and had a maximum depth of 5 inches. He had come to the conclusion that it was caused by an excavation not having been properly filled in. Some new material should have been used and rammed. His idea was that the hole was about six months old; certainly, it was rather worn.

Cross-examined: His examination was made on the 14th of February. The hole was caused by traffic over a place which had not been properly reinstated.

Mrs. *Waller*, the occupier of No. 62, York Street, spoke to the Company having made the excavation in May, 1904. She said she noticed the hole both before and after the accident.

Cross-examined: A timber yard was opposite her house, and heavy waggons used to turn about where the hole was.

This closed the plaintiff's case.

The first witness for the defendants was *John Chopping*, a foreman in the service of the Borough Council. He stated that last February he examined the scene of the accident, and found a hole 2 feet in diameter and 1 inch in depth near the kerb, and graduating a little deeper towards the road. The hole was caused by the ordinary wear and tear of the traffic.

Cross-examined: He was certain there was no other cause for the hole than that which he had stated. There were other and deeper holes in the road; but none of them were dangerous.

Mr. *J. G. Harris*, District Foreman to the Council, said his duty was to look after the roads and the reinstatement of excavations.

Mr. ROSTRON: Is it a practice of the Council, when excavations are made by the Gas Company, to reinstate them?

Mr. ABRAHAMS objected to the question; and it was upheld.

In further examination, witness said he remembered the excavation made by the Company to connect their mains with No. 62, York Street; and the road was reinstated by the Council. He did not do the work himself, but supervised it, in May, 1904.

At this point, the further hearing of the case was adjourned.

Thursday, Dec. 7.

On the resumption of the hearing to-day,

Mr. *Harris* was recalled, and stated that he examined the hole on the day after the accident, and found it 2½ inches in depth. The road had not been made up between the time it was reinstated and when the accident occurred.

Cross-examined: Before he saw the hole, it had been filled in with screened ballast; and he moved this to ascertain the depth of the hole, which was caused by the traffic. A portion of the road had been blocked for some months before, owing to the Waterloo Station extension.

Mr. *H. C. J. Edwards*, the Engineer to the Borough Council, said he had not seen the hole, but, from the statements made to him, and from the evidence given in Court, he was of opinion that it had been caused by wear and tear of traffic. The Borough Council always reinstated trenches made by the Gas Company. They charged them for doing the work in question, and had been paid.

Cross-examined: He pledged himself that the hole was not caused by a subsidence.

Judge EMDEN: Did you see the work done?

Witness: No.

Then how can you pledge yourself that the hole was not caused by a subsidence?—By experience.

Judge EMDEN: Experience, in my opinion, cannot enable you to pledge yourself when you did not see the work done.

Mr. *H. E. Anderson*, the Assistant-Surveyor to the Council, deposed that he visited the hole on the 28th of February, and after clearing away the ballast found its depth to be 2½ inches. In his opinion, the hole was caused by the wear and tear of the traffic.

Cross-examined: If there was a subsidence, there would be a hole with abrupt edges. In this case the hole was dish-shaped.

This closed the defendants' case.

Police-constable *Raymond*, who was unable to attend on the previous occasion, was called for the plaintiff. He stated that he examined the hole immediately after the accident, and before any ballast was put there. It was about 2 ft. 6 in. square; and its greatest depth, as measured by a rule he carried, was 4 inches.

In answer to his HONOUR, witness said the hole was distinctly dangerous for anyone stepping off the kerb.

Cross-examined: In his report to his superior officer, he expressed the opinion that the hole was caused by heavy traffic. He had since modified this view, and believed now that it was the result of a subsidence.

Mr. ROSTRON then addressed the Court for the defendants. With regard to the facts of the case, he contended that as there was a distance of 7 inches from the kerb to the channel, the extra 4 inches of the hole could not cause the accident. He submitted that in law the defendants were not liable.

Judge EMDEN: The Company allege they are not liable, and the Borough Council allege that they are not liable. What is a citizen to do between the two?

Mr. ROSTRON (continuing) pointed out that as the reinstatement was carried out by the Borough Council, it would be very hard to hold the Company responsible for negligence on their part. It was also to be borne in mind the Company had no control over the Council's acts.

Mr. ABRAHAM, in replying, urged that in law the defendants were liable, and no one else.

Judge EMDEN: They would be liable if they did the work themselves.

Mr. ABRAHAM: The Act does not exempt them under the circumstances.

Judge EMDEN: If you read the sections of the Act together, it may be different from reading each section separately.

Mr. ABRAHAM remarked that if the Company employed a contractor to do the work, they would still be liable.

Judge EMDEN agreed, but said that in this case the Council did the work under a statutory right.

After some further argument,

Judge EMDEN said, the whole question, as regards the law, was whether the Company were bound to allow the Council to do the work or whether it was optional.

Mr. ABRAHAM argued that the Council only did the work on the express invitation of the Company, who could have employed any contractor to do it. Gas companies were continually opening roads, and it would be very hard on the ratepayers to be held liable for all accidents which occurred through these openings.

Mr. ROSTRON contended that, under section 114 of the Metropolis Management Act, the Company had no power to prevent the Council doing the work.

Judge EMDEN: What about your liability to repair under section 10?

Mr. ROSTRON submitted that this section did not apply here.

Judge EMDEN, in delivering judgment, said he held as a fact that the accident was caused by the excavation, and also that there was negligence in filling in the excavation. Further, having regard to the depth and position of the hole, he held that it was a nuisance. The plaintiff was placed in a very awkward position between the Company and the Council. It was very hard on her; but he must find, according to the law, for the defendants. It was impossible to hold that the Borough Council, having undertaken the work of reinstatement, were not liable for accidents which occurred through the work being negligently performed. Though he dismissed the action, there would be no order as to costs.

Mr. ABRAHAM asked for leave to appeal.

Judge EMDEN: Certainly. I assess the damages, in case my decision should be reversed, at £22; and I will also certify for costs on the higher scale on the ground that the case is of public importance.

HIGH COURT OF JUSTICE—REFEREES COURT.

(*Before Mr.* MUIR MACKENZIE.)

East Ham Corporation v. Ilford Gas Company—Assessment of Damages Caused by Floods.

This inquiry into damages, alleged to have been caused by the negligence of the defendant Company (*ante*, p. 692), was concluded, as far as the hearing was concerned, last Wednesday.

Mr. DUKE, K.C., in opening the defendants' case, said that the claim made by the plaintiff Corporation was a vague and misleading one, for they had treated the matter as though any damage done had been caused altogether by the flooding coming from the gas-works, regardless of the fact that for days previous there had been an unprecedented rainfall, and flooding of the Roding Valley, which, in any case, would have caused considerable injury to property. The plaintiffs could only recover the actual increased cost of anything they had had to do within their statutory duty, which, he maintained, did not include the carrying of people, pumping out of houses, or the distribution of disinfectants.

Mr. *A. A. Johnson*, Engineer and Manager of the Ilford Gas-Works, was the first witness, and was examined by Mr. S. MAYER. He said the local roads were in good condition before the flood, and were practically in the same state afterwards. He visited the Corporation sewage works in May of this year, and found the machinery, alleged to have been damaged by the flood two years previously, still running well.

Cross-examined by Mr. RICHARDS, he thought the damage would have been the same even if the river bank had not given way.

Mr. *Herbert Tooley*, Architect and Surveyor to the Buckhurst Hill Urban Council, said his district, which was adjoining and higher than East Ham, had also been flooded from the heavy rainfall. A million tons of rain fell in three days; and the marsh lands were saturated.

Mr. *E. K. Burstall* said that 3·57 inches of rain fell in three days over the 130 square miles of the Roding Valley. June, 1903, was the wettest known in the South of England since rain-gauges were introduced in 1735.

Other witnesses spoke as to the abnormal rainfall, and also as to the good condition of the roads, which only required slight repairs.

Mr. *J. S. Tyler*, Solicitor to the defendants, in cross-examination, said there had been no damage done to the roads; and he thought the claim put in was a fraudulent one.

Mr. DUKE summed up the evidence at some length. He said it had been an astonishing action in many respects; and fifteen months had elapsed before it was sought to make the defendants liable for the flooding in June, 1903. He went in detail through several of the items claimed, and showed how unsubstantiated they were. Some of the particulars given had turned out to be absolutely untrue. He asked for merely nominal damages, if any, to be awarded, and for the defendants' costs to be allowed.

Mr. MONTAGUE LUSH replied for the plaintiffs, repudiating the charge of fraud or conspiracy, but admitting that the first claim had been put higher than it ought to have been. He now asked for £607 for damage to roads, &c., and £140 for loss to the sewage works.

The OFFICIAL REFEREE said he would visit the locality, and give his award as soon after as possible.

MISCELLANEOUS NEWS.

PRICE OF GAS TO MANUFACTURERS IN BIRMINGHAM.

The Proposed Reduction Agreed to.

At their Meeting last Tuesday, the Birmingham City Council had before them the recommendation of the Gas Committee that, from the Christmas quarter, the price of gas used exclusively for motive power purposes should be reduced to 1s. 7d. per 1000 cubic feet (less the usual discount of 5 per cent. for prompt payment), provided over 100,000 cubic feet per quarter be used on one premises; the charge for smaller quantities to remain at 1s. 10d.

In moving the adoption of the recommendation, Alderman Sir Hallewell Rogers said it was made only after careful consideration and thorough investigation on the part of the Gas Committee. The regulation of the charges to be made for gas from time to time was by no means an easy matter. A variety of interests were concerned; and not only had each class of consumer to be considered, but the interests of the ratepayers generally had to be guarded. The Committee felt that the adoption of the proposal would be to the best interests of all concerned. As long ago as July, 1903, the Committee had under consideration the cost of the various producer gases that it was alleged would effect considerable economies to manufacturers if utilized for motive-power purposes. From information then available, they felt that serious competition with town gas was at hand; and if the prediction of eminent engineers proved correct, it might be difficult to retain indefinitely the present consumption of town gas for motive-power purposes. Since that time, considerable progress had been made towards perfecting producer plants. Last July, the Committee, to meet this competition, and also to place the Birmingham manufacturers on more equal terms with their competitors in the surrounding districts, advised the Council to place all consumers of gas for motive-power purposes on the lowest current rate of 1s. 10d. per 1000 cubic feet, irrespective of quantity used, instead of conforming to the differential charges of 2s. 6d., 2s. 3d., 2s., and 1s. 10d. per 1000 cubic feet, according to the quantity supplied. While the last revision secured considirable advantage to the smaller users of gas, it gave no relief to the larger consumer for motive-power purposes. The Gas Department was necessarily in close touch with the commercial life of the city; and representations had been made to them from a large number of sources—representations that it would not be wise to ignore—that unless the department was prepared to reduce prices, it was probable a large portion of the output of gas supplied for motive-power purposes would be lost to the Corporation. The matter needed to be dealt with promptly. It was a question which not only affected that, but many other gas undertakings throughout the country; for it had now become the usual practice of companies and corporations supplying manufacturing centres to have separate and lower rates for gas used for power. The Committee would deprecate anything that might be considered as unfair trading. They were not seeking to attract new customers requiring very large quantities of gas, but were endeavouring to retain for the Corporation and the citizens as many as possible of their present consumers, in respect of whom the department had been at considerable expense in laying down costly manufacturing and distributing plant. The total expenditure of the department, including annuities, interest, and sinking fund charges last year, amounted to £790,000—of which £590,000 was manufacturing charges, and £200,000 fixed or dead charges. Assuming they lost half of their business for power gas (equal to 7½ per cent. of the entire output), it would reduce the manufacturing charges by, say, £40,000. On the other hand, the income from gas and residuals last year amounted to £866,000; and if they lost half of the power-gas consumption, and 7½ per cent. of the income from residuals, it would lessen the income by £54,000. So that, while they would expend £40,000 less on materials and labour, they would lose £54,000 in income, and their profits would be thereby effected to the extent of £14,000. The question the Committee had to determine was whether the proposed reduction in the price of power gas, estimated at approximately £8000, should be made, or whether the department should risk a probable net loss of not less than £14,000 a year. The Committee decided to recommend the adoption of the former course. They were not proposing that the lower charge should apply to smaller consumers of gas for motive power than of 100,000 cubic feet per quarter—which was about the quantity used in a 10-horse power engine—as those consumers were reaping considerable benefit by the recommendations made in July. Most of them were then paying either 2s. 3d. or 2s. 6d. per 1000 feet for their gas. Probably by the present recommendation they would not retain the largest consumers; for it might suit their purposes to manufacture their own power gas. He did not think it would be advisable to make the necessary annual additions to their plant for the benefit of a few large consumers, who, should any cheaper power be put upon the market, would naturally adopt it without considering the effect of their action on the Gas Department. But the Committee believed that the alteration in price would retain the larger number of manufacturers who used gas for motive power purposes. The issue was plain. If their turnover were reduced, the fixed or dead charges—which in an undertaking of this magnitude were considerable—would probably remain the same, and on the reduced income must become a heavier burden on continuing consumers. They were confident that it was for the benefit of the small consumer, who used gas for lighting purposes only, that the department should, by using its mains throughout a longer period each day, obtain the largest possible output of gas from the manufacturing and distributing plant already provided. The average price of gas in Birmingham compared favourably with that of other towns and cities in like circumstances. The proposed reduction could be made without increasing the charges to other classes of consumers. The Committee might be asked if they would be able to maintain the £50,000 annual contribution to the rates. They could not promise; but by careful

management and economy in expenditure, they would endeavour to raise an amount as near this sum as possible. If the recommendation were not adopted, the department, by the probable loss of a number of the larger consumers, would certainly be far less able to make the contribution.

An amendment that the recommendation should be referred back for further consideration was moved by Mr. Stevens, who argued that, as suction gas was in its infancy, a waiting attitude should be adopted. He said the difference between the price of gas for motive-power purposes and for lighting was too great. It was unfair to the smaller consumers; and he would not be surprised if there were an agitation on the matter. Mr. Kenrick, on the other hand, thought it would be folly to wait to see the perfecting of the producer-gas invention. Mr. Toller contended that the smaller consumers had as much right to be considered as the larger ones. In many towns the different grades of consumers were put on the same level; and he did not see why this course should not be adopted in Birmingham. Mr. Brown thought it was obvious that suction gas was going to be a competitor with ordinary gas. In his judgment, the Gas Committee had acted wisely. It would be easier to treat with gas users at present than to delay the matter. In the meantime, they might lay down plant. Mr. Tonks said it should not be forgotten that the cost of gas to the small consumers was largely regulated by the consumption of the biggest consumers. By considering them, all were being duly considered. Mr. Harrison Barrow pointed out that the demand by the users of gas-engines was constant throughout the year; while the private consumption of gas was confined mainly to the winter. Mr. James Hunt said he could see no reason why they should set up competition with suction gas. He was not anxious to see the gas-works increased. In reply, Alderman Sir Hallewell Rogers remarked that, unless they retained the trade for power gas, they would probably have to increase the price to the small consumers, or contribute much less in aid of the rates. He hoped the smaller consumers would see that the Committee were helping them by endeavouring to retain the motive-power custom.

On the matter being put to the vote, very few members supported the amendment; the Committee's recommendation being adopted by a large majority.

QUALITY AND PRICE OF GAS AT NOTTINGHAM.

At the Meeting of the Nottingham City Council last week, some discussion took place regarding the alleged shortcomings of the gas supply. The question arose over a letter written to the Council by a Mr. Stevenson, complaining of the supply to his house. It was proposed that the letter should be sent to the Gas Committee; but Mr. Harlow, the Chairman of the Committee, said it had already been considered by them, and he was prepared to publicly answer it at once. After further talk, Mr. M'Craith put a question of which he had given notice—whether, in view of the dissatisfaction existing among consumers, the Gas Committee proposed to increase the candle power of the gas or otherwise make it more satisfactory. Mr. Harlow asked that, in view of this question and the publicity given to Mr. Stevenson's letter, he should be allowed to give some explanation. Alderman Fraser said a charge had been made by Mr. Stevenson (to which he did not attach any undue importance, because scores of others had made similar complaints before); and he proposed that the matter should be seriously considered by the Gas Committee, and a full report brought up for discussion by the Council. This was agreed to. Another letter was then read, from Mr. Pilkington, Lord Middleton's Agent at Wollaton, who described the gas as "some terrible compound," for which he was "charged an exorbitant price as gas." Mr. Harlow said the whole of Mr. Pilkington's trouble was caused by his gas-fittings. His service-pipes were not big enough to get a proper supply through. It was absolutely impossible to remedy the defective supply so long as his pipes were allowed to remain in their present state. As to the purity of the gas, there had, so far as he was aware, been no complaint. An extremely delicate chemical test was in constant operation throughout the day at five different points in the city; and the presence of any compound, in however minute quantity, which would cause a smell, would be traced immediately. Any odour arising from the gas must be due to imperfect combustion. So far as Mr. M'Craith's question was concerned, Sir George Livesey, in his report to the Council two-and-a-half years ago, said: "I have no hesitation in recommending you to reduce your gas to 14½-candle power." The gas in Nottingham at present was more than 1 candle above this. Alderman Sir John Turney: All this had better be left to come in the report. What was right two years ago does not apply to-day.

In the course of an interview on "The Gas Question" with a representative of the "Nottingham Daily Express," Mr. E. Jardine, the head of a large firm of machinery manufacturers, and a Director of the Raleigh Cycle Company, pointed out what he described as the utter folly of people believing that a political party could run a business concern as well as a hard-headed business man could run it. He thought that gas, water, and trams should be in the hands of the municipality—in fact, anything that involved tearing up the roads—and if the two political parties would join (which he saw no chance of their doing) and invite the best people in the town to give their services, if they would appeal to local patriotism, they could succeed in managing the gas undertaking nearly as well—not quite, but nearly as well—as private concerns were managed. He then proceeded to discuss the matter of price; stating that last year the Raleigh Cycle Company paid £2542 for Nottingham gas, whereas the price for the same amount of Sheffield gas would have been £1657. The Company had decided to instal a producer plant on their own works; and he thought the putting up of such apparatus would extend. He concluded by saying: "Anyone who uses gas, even to a much smaller extent than the Raleigh Company, should, and will, put in such plants, not for the purpose of illumination, but for power. The amount of gas used for driving machinery will undoubtedly increase; and, instead of the Corporation supplying it, people will prefer to instal their own plants, of which there are very many systems in the market. In my Basford works, I have spent in the past few years about £15,000 in electrical power plant; whereas now, if I had the same money to spend for the purpose, I should put in gas-engines to be driven by an installation of my own."

Still further remarks on the subject have been voiced by members of the Nottingham Chamber of Commerce, who have been finding fault with the Gas Committee for not replying to their complaints—though an unofficial communication had been received from the Chairman of the Committee saying that the matter was still under consideration. A combined attack was then made on the policy of the Committee; one member complaining of the price, another of the quality, and a third of the unequal and unfair treatment meted out to manufacturers. It was pointed out by Mr. Hancock that what one man for manufacturing purposes had to pay £58 6s. for, another, if he used a gas-engine, was only charged £37 10s. Mr. Stiebel said he had been 44 years in Nottingham, and he had never known the gas to be as bad as it was at present. Mr. Bourne thought it unfair that they should have to pay such a high price in order to ensure large profits. It was reported that the Chamber was thoroughly in sympathy with the sentiments expressed.

THE LONDON COUNTY COUNCIL AND THE LONDON GAS ACT, 1905.

At the Meeting of the London County Council this (Tuesday) afternoon the Public Control Committee will submit the following report dealing with the London Gas Act, 1905, which comes into operation on the 1st prox., and which relates to the gas supplied within the County by the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company.

The Act, the Committee state, empowers the Gas Referees to prescribe from time to time a burner for testing the illuminating power of gas, which burner is to be of such a pattern (not being an incandescent or similar burner) as shall be practicable for use by the consumer, and shall be the most suitable for obtaining from the gas, when consumed at the rate of 5 cubic feet an hour, the greatest amount of light. The Act also provides for testings being made for calorific power and for illuminating power with a flat-flame burner. These latter testings, however, are for the purpose of information only; and the Companies are not liable to forfeitures in respect thereof.

The Act further abolishes forfeitures for excess of sulphur impurities (other than sulphuretted hydrogen) in gas. Although relief in this respect is not authorized by the Act until the 1st of January, 1906, it was understood when the Bill was before Parliament that, in the event of the measure becoming law with this provision included, proceedings should not be taken after the 1st of October, 1905, in respect of any excess of sulphur in the gas. Testings since the latter date show that the gas supplied by certain Companies has been charged with a greater amount of sulphur compounds than was stated by the Companies' witnesses would be present in the gas if purification by lime should cease. We hope that the proportion of sulphur impurities in the gas will diminish when the Companies have had more experience of the new method of working. The Council will probably remember that we were not in favour of legislation for removing the restrictions with regard to the presence of sulphur compounds in the gas; but the Companies maintained that there was no method by which these compounds could be removed without creating a nuisance in the process of purification. We shall endeavour as far as possible under the new Act to safeguard the interests of the consumer in this matter.

The Act also provides that, in the event of a Gas Company neglecting or refusing to comply with any lawful prescription or certificate of the Gas Referees, or to provide or maintain any testing place, apparatus, &c., prescribed or certified therein, the Company shall be liable to a penalty not exceeding £50 for each day during which such refusal or neglect continues. This provision will, we hope, have the effect of preventing in future the closing of the testing-places by the refusal of any Company to comply with the notification of the Gas Referees, as has been the case for some time past with two of the testing-places in the county.

The remaining provisions of the Act are of less importance, and are of a more technical nature. They are generally on the lines set out in our report to the Council on Oct. 11, 1904.

Public Lighting of Larne.—The Larne Urban District Council recently had before them revised tenders for the lighting of the town. The Electric Light Company offered to undertake the work for a sum of £450 per annum for a term of three years; while the Gas Company tendered £300 for winter lighting and 12s. 6d. per lamp for summer lighting, exclusive of the erection of new lamp-posts or the provision of mantles. It was proposed that the Gas Company's tender should be accepted; but an amendment in favour of the Electric Light Company's offer met with more favour—it being carried, after considerable discussion, by six votes to two.

Manchester Corporation Officials' Thrift Fund.—The past year has witnessed a large increase in the amount at the credit of the thrift fund contributed to by those in the employ of the Manchester City Council; the sum now being £163,381, as compared with £136,416 twelve months ago. This is explained by the fact that, owing mainly to the amalgamation of out-townships in 1904, there has been an increase of 480 in the number of contributors; the total number being now 5825. Mr. Charles Nickson (Gas Department), Mr. J. Grimshaw (Highways Department), Mr. R. Williamson (Cleansing Department), Mr. J. E. Rison (Town Hall Department), and Mr. C. H. Wyatt (Elementary Education Department) have been elected a Cousultative Committee for the purposes of the scheme.

THE GAS SUFFOCATION FATALITY IN NORTH LONDON.

Adjourned Inquest—Verdict of "Accidental Death."

Last Friday, Mr. WALTER SCHRÖDER, the Deputy-Coroner for Central London, resumed, at the Coroner's Court, Holloway Road, the inquest on the bodies of Joseph Puller, Catharine Southby, and Nellie Theresa Southby, who were found suffocated at No. 46, Kingsbury Road, Ball's Pond Road, early in the morning of the 22nd ult. (see *ante*, p. 630.)

Mr. GILBERT S. ELLIOT (Messrs. Robinson, May, and Elliot) appeared on behalf of Mrs Austin, the landlady of the house; and Mr. MONIER-WILLIAMS (Messrs. Bedford, Monier-Williams, and Robinson) represented the Gaslight and Coke Company.

The two survivors, *James Southby* and his son (aged 11), were called, and stated that they knew nothing about the matter, after retiring to bed on the 21st ult. until they regained consciousness at the German Hospital the following day.

Mr. *W. C. Wigley*, one of the Company's Divisional Inspectors, was then examined. In answer to the CORONER, he said that when he heard of the accident he went at once to the house, arriving there about nine o'clock in the morning. He discovered a 3-inch main broken clean in half. It was lying in very good subsoil, principally burnt ballast—a good solid bed. He could not see any silting of the earth. The break was 17 feet from the railings. [A plan was here handed to the Jury.] Witness thought the escape might have occurred between eleven and twelve o'clock at night, and the gas would percolate very easily through the earth, especially in burnt or brick ballast. The pipe he had examined was a cast-iron one, and he found no flaw in it; in fact, it was a splendid pipe. He had no opinion to offer as to the breakage unless it was through the tremor of the earth or on account of the heavy rain and the sudden frost. The pipe was laid at a depth of 2 ft. 2 in. They had a number of men always patrolling the streets; and if there was the slightest smell, it would be traced immediately. The pipe had been laid about fifty years; but in a good soil, such as this, it would last practically for ever. There must have been a tremor of the earth, or else a vibration of some sort, that caused the accident in question.

Mr. *G. F. L. Foulger*, the Chief Distributing Engineer of the Gaslight and Coke Company, said he heard of the occurrence on the morning of the 22nd ult. He went to Kingsbury Road and examined the pipe, which was a cast-iron one and exceptionally good. He could not find the slightest flaw in it. He had come to two conclusions as to the cause of the accident—that the clean break might be due to depression caused by the passing of some heavy vehicle, and that it was compatible with a sudden frost following on a period of exceptionally heavy wet weather, which would cause a general movement of the ground. Permanent ways of railways were very often similarly affected. The pipe in question was laid with more than ordinary caution, it being down 2 ft. 2 in., while 2 feet was considered a very good depth with the present experience of heavy traffic. The Company had 2148 miles of cast-iron pipes, ranging from 4 inches up to 4 feet in internal diameter, and 2000 miles of wrought-iron service-pipes. The method of laying the pipes was first to excavate the trench, putting the hard stuff on one side and the soft on the other, so that the soil could reoccupy its original position when filled up again. The pipes were known as spigot-and-socket, the spigot end being pushed hard up into the socket end. Then a strand or two of yarn was rammed in; but no reliance was placed upon it to make the joint case-tight—the object being merely to prevent the molten lead running into the pipe. Specially constructed tools called "sets" were used, in conjunction with a hammer, to ram the lead up and make it tight. Concrete would be the most dangerous thing to use in conjunction with cast iron. Hardly a week passed without his having to threaten some local authority with an injunction to restrain them from bringing concrete into contact with the cast-iron pipes. The quantity of gas escaping would be about 15 cubic feet per hour. Gas would easily percolate through the earth, and take the line of least resistance. If the roadway was hermetically sealed with ice (as one witness said), it would close the surface, and allow the gas to travel laterally. He had no hesitation in saying that had it not been for the sharp frost and heavy fog which was formed into ice, the present inquiry would not have been necessary. As a matter of fact, accidents such as the one under investigation occurred more in the winter than at other periods of the year.

In answer to Mr. MONIER-WILLIAMS, witness said that even if he had had to open the ground he would have seen no reason to alter the pipes. The one broken was not in any way worn out.

Mr. *P. A. Moss*, the Assistant-Engineer of the Islington Borough Council, said that Kingsbury Road was an old one, and the surface was repaired in April last. The Gas Company always gave them notice of their proposal to lay a new main. They submitted a plan showing its position and the depth at which it was intended to be laid. When a plan was received from the Company, the depth was always stated upon it; and the understanding was that the depth in a road such as this should be 2 feet. If 18 inches were put down, his Committee would not sanction it. He believed that, as the road authority, they had power over the pipes.

Mr. *Foulger* said the Council had no statutory powers. Notice had to be given to them with regard to the breaking up of the roads, and plans had to be submitted. The Gas Company were at all times most willing and ready to listen to any reasonable requirements of the local authority.

Mr. MONIER-WILLIAMS explained the legal position as being that a local authority could refuse any measurement, and then the Company would have to go to the Board of Trade, who were really the Court of Appeal in the matter.

The CORONER having summed up the case,

The Jury, after briefly conferring, found that the deceased died from suffocation due to gas poisoning, caused by the inhalation of gas escaping through the roadway into the house No. 46, Kingsbury Road; and further that it was a case of accidental death.

LEEDS CITY COUNCIL AND THE GAS WORKERS.

The Question of Sunday Work.

Considerable discussion of the question of Sunday labour at the gas-works took place in the Leeds City Council last Wednesday, when the Gas Committee's minutes were presented. The Chairman (Mr. Ratcliffe) referred to the refusal of the Gas Workers' Union to submit to arbitration the question between the Committee and the men as to the six or seven day week. The excuse put forward for this attitude was the prejudice shown by the Chairman and other members of the Committee; but how prejudice on anyone's part could affect the Conciliation Board, he (Mr. Ratcliffe) did not know. He wished to thank individual members of the Labour Party for the support they had given to the Gas Committee's proposals, and particularly Mr. Thaxton. He had no desire to force anything upon the workers. The attitude of the Gas Committee had been honest and straightforward. They thought they had a case which, if put before an impartial body, would be approved. Believing this, the Committee had gone out of their way to try to bring about an understanding with the men. He had been asked what the Committee now proposed to do; but he was not in a position to say. It was urged that they could shut down the works on Saturdays; but this he denied. Supposing, however, the argument were granted, he would point out that it would be necessary to employ 130 men to stoke the fires, to keep the retorts ready for gas making on the Monday. Now these 130 men would be taken from the men who had already worked from the Monday to the Saturday. Did the workers' officials propose that these men should still go on working seven days?

It was pointed out by the next speaker, Mr. Badley, that other towns found it practicable to do away with Sunday labour. If a number of men were required to keep up the heats on Sundays, surely there were plenty out of work who would be ready to do this. Alderman Buckle said he understood that the Gas Committee had guaranteed six days a week to every man in the works, with time-and-a-half pay for Sunday, if Sunday was one of the six days. The men argued that all Sunday labour could be dispensed with; while the Committee said this was impossible. The point should not be a difficult one to overcome. If a workman had six days' employment a week guaranteed, he was placed in a strong position. It was the first time, to his knowledge, that workmen had had a six-day week guaranteed; and it was an important point to him. In giving this guarantee, the Committee incurred increased expenditure; and therefore they could not be charged with selfishness. Alderman Hepton remarked that if the Committee's proposal was adopted, the stokers would have to work on more Sundays than at present. They were working now about forty-five days every seven weeks, which included three Sundays on and four off. Their earnings during that period were £12 8s.; and under the new arrangement they would be £12—a loss to the men of 8s. spread over seven weeks. He did not, however, think that there would be any monetary loss in the change, because, while the new proposal would give a guarantee of £12, there was some risk under present conditions of the men not obtaining the maximum of £12 8s. In addition, the men would get three days more holiday than at present. Other members urged the desirability of making an earnest effort to do away with Sunday labour.

Replying to the discussion, Mr. Ratcliffe said the question was not whether they could make sufficient gas in six days to last seven, but whether they could store enough to last over 24 hours of a Sunday, and also be ready to supply on the Monday if foggy weather came. He insisted that it was impossible to abolish Sunday labour. After the great gas strike in Leeds, the Committee made up their minds to close down on Sundays; but they found they could not. They were forced to work 19 Sundays out of the 52, and in 1895 were working 24. The Corporation now were in a worse position for shutting down than in 1895. With one exception, no gas-works in the country closed down entirely on Sunday. Bradford had been referred to; but as a matter of fact the stokers there worked on Sundays in the six winter months, and during the six summer months they worked on Sundays as little as they could. A suggestion had been made that the unemployed should be brought in simply to do the firing on Sundays; but while he was Chairman of the Committee, there would be no such resolution as that. If the unemployed were brought in, they would be brought in for six days, like the other men. It had been said that at Leicester the gas-works were the model for England. Well, in that town the system under which the men worked was the one the Leeds Gas Committee wished to introduce, with the exception that at Leicester the men had not a guarantee of six shifts. In Leeds, they were prepared to guarantee the men six shifts.

The minutes were adopted; and the Council authorized the Gas Committee, for the period ending March 31 next, to make experimental tests in the candle power of the gas supplied to consumers, in accordance with the powers contained in the Leeds Consolidation Act (1905). A proposal that depôts for the sale of coke should be opened in the different wards of the city was afterwards referred to the Committee for consideration.

TOTTENHAM URBAN COUNCIL AND THE GAS COMPANY

Gas Lighting and Extinguishing Appliances—The Laying of Main and Service-Pipes—Sulphur in the Gas.

At the Meeting of the Tottenham Urban District Council on Tuesday, the General Purposes Committee reported, in reference to the matter brought before the Council on the 26th of September, with regard to the automatic lighting and extinguishing appliances which had been fixed to various public-lamps by the Gas Company without the consent of the Council, that they had inspected the lamps fitted with the appliances, and had also interviewed Mr. Broadberry, the Company's Engineer, with reference to the matter. The Company regretted that inadvertently they had not asked the Council's permission to make the alterations; and they asked that the appliances should be allowed to

remain, and that they be permitted to fix them to the remainder of the lamps in the district. The Committee recommended that the request should be acceded to. The Committee further reported that, in accordance with the instructions given by the Council at the last meeting, they had directed their Engineer to make inquiries as to the possibility of the Company laying the house services at the time the gas-mains were laid, or a dual system of mains—one on either side of the various roads put down—so as to prevent the continual breaking up of the carriage-ways. The Engineer stated that he had been informed by Mr. Broadberry that his Directors had instructed him to put down dual mains where he considered it desirable, and also to lay services up to the houses fitted for gas in all new streets, where there was a prospect of a gas supply being required. The report and recommendation were adopted. The Public Health Committee reported that the sulphur in the gas supplied on the dates named was as follows: Nov. 9, 24·9 grains; Nov. 10, 24 grains; Nov. 11, 23·1 grains; Nov. 13, 24·4 grains; Nov. 14, 29·2 grains; and Nov. 15, 28·9 grains. The average excess for the six consecutive days was 5·9 grains. Under these circumstances, the Committee recommended the Council to again institute legal proceedings against the Company. The recommendation, however, was negatived.

THE SUPERANNUATION FUND OF THE SOUTH METROPOLITAN GAS COMPANY.

Its Jubilee—A History of Success and Beneficent Work.

Sir George Livesey has contributed an interesting article on this subject to the "Co-Partnership Journal" of the South Metropolitan Gas Company. It is seen that the superannuation fund of the Company had a small beginning; but what its ending will be like—if it ever does end—it is difficult to foretell. The financial status and work of the fund is great now, and is destined to be yet greater. From the article a few extracts are given. Sir George writes—

Sympathy for, and a desire to help, the Company's workmen in times of difficulty from sickness or old age originated both the Sick and Superannuation Funds. The Sick and Burial Fund was started in 1842 on the suggestion of the Company's Secretary, the late Thomas Livesey; and its success led him in 1855 to advise the creation of a Superannuation Fund for Workmen and Officers. But the latter did not then respond; and it was nearly 40 years later when their Fund came into being. On Dec. 1, 1855, the Workmen's Superannuation Fund began; and for exactly 50 years it has continued its beneficent work.

The fund was founded and is maintained for the sole object of making provision for the Company's men when their working days are over to save them from distress in their old age, or, as is stated in Rule 1, "to provide a minimum pension in order to save workmen from the necessity of applying for parish relief in the event of incapacity or old age." It was never intended to provide them with a competency to enable them to retire while still well able to work. This being so, it was necessary to assume that, at a certain average age, work should cease and pensions begin, which was fixed at 65. This is the age almost universally adopted by superannuation and pension schemes. But our fund goes further. It provided, at the start, in order to take in the older men, that subscribers of ten years might receive a pension at 65, or at 55, if through infirmity (not being due to their own bad conduct) they were unable to continue working. It now, in such cases, gives the pension at any age after ten years' subscription and twenty-five years' service. In 1900, a further step was made by giving the option to the members to retire as early as 55 on a reduced pension. There was to be a reduction of one-tenth for each year short of the pension age of 65. And now I have the pleasure of announcing a further improvement.

The Directors have lately had under consideration the Officers' Superannuation Fund, and have introduced a similar rule to allow earlier retirement. Calculations, supported by professional advice, proved that a reduction of one-twentieth part of the pension for each year short of 65 was sufficient; and a new rule was adopted accordingly. It works thus: Supposing an officer, entitled to a pension of £100 a year at 65, wishes to retire earlier, he has to give up one-twentieth, or £5, for each year short of the proper pension age. For instance, at 64 he would get £95, at 63 £90, and so on; at 60 it would be £75, and at 55 £50, or half the full pension would be received. I need hardly say that, having done this for the officers, the Directors at once resolved to do the same for the workmen; and the new rule now makes the reduction one-twentieth instead of one-tenth. A workmen entitled to 10s. a week at 65 will have 6d. a week less, or 9s. 6d. at 64, and so on; at 60 he will get 7s. 6d., and at 55, 5s. a week. If he is entitled to 15s. a week pension at 65, he will have one-twentieth part, or 9d. a week, less for each year, or 14s. 3d. at 64, 13s. 6d. at 63, 11s. 3d. at 60, and 7s. 6d., or half-pension, at 55.

By the original rules, the pensions were fixed at 10s. weekly for subscribers of 3d., and 14s. for 6d. subscribers, whether a man had paid for 10 years, or 40, or more. This was altered in 1887, and now 10s. is the minimum or lowest pension for weekly subscribers of 3d., the scale rising from 10s. after 25 years' subscriptions to 17s. for 43 years' membership, and the 6d. subscribers are dealt with in the same proportion. The Company began by subscribing £50 a year, which was increased to £100 in 1862, to £150 in 1864, to £200 in 1876, and in 1881 to 40 per cent. of the members' subscriptions, or £322. Then in 1891 it was increased to 100 per cent., or £1232, and in 1900 for a time to 133 per cent., or £3574.

In 1880, the Surrey Consumers' and the Phœnix Companies were amalgamated with the South Metropolitan; and their men were at once admitted to the same privilege. The next year, the finances of the fund having been investigated, the Company's contribution was increased to 40 per cent. of that of the members. In 1891, it was further increased to 100 per cent., and in 1900, after another actuary had reported that the fund was not sound financially, the Company guaranteed the stability of the fund—that is, they undertook to pay the agreed pensions under any circumstances; and they increased their contribution for a time to 133 per cent. They also agreed to secure 5 per cent. on the yearly balances to be invested, by adding the necessary amount of money, which is shown in the annual accounts. And the Company have also borne all the expense of keeping the accounts and working the fund, which is considerable.

The totals received from all sources and the totals paid out from the start to Dec. 31, 1904, are here given—

RECEIPTS—			
Members' payments . . .		£38,031 12 3	
Company's contributions . .	£33,351 14 3		
Ditto to make up investments to 5 per cent. . .	3,429 5 1		
		36,780 19 4	
Interest received		24,259 7 2	
Profit on sale of investments .		3,691 6 11	
			£102,763 5 8
PAYMENTS—			
Superannuation allowances .		43,555 10 7	
To representatives of deceased members and members leaving the Company's service		11,133 12 4	
			£54,689 2 11
Balance in hand Jan. 1, 1905			£48,074 2 9

Of this balance, £43,798 8s. 5d. had been invested in the Company's stock; and there was £4275 14s. 4d. in hand invested this year.

With so much balance why cannot the fund deal more liberally, some may think. Suppose it were to be wound up, the £48,000 or so in hand would have not only to maintain the present pensions of about £3000 a year—£2960 was paid last year to 112 pensioners—but it would also be called upon to provide pensions for, or otherwise to compensate, all the present members. The interest received last year was £1965, or £1000 less than the sum paid in pensions. Therefore one-third of of the pensions, or £1000 a year, is taken from current subscriptions, whereas these subscriptions are needed to provide future pensions. It was this deficiency that led the Directors to propose, and the shareholders to agree, to guarantee the fund. They also agreed to increase their subscriptions for a time from 3d. to 4d. a week per member, or to 133 per cent., and to secure 5 per cent. on the investment. It is hoped that by these means the interest on the invested funds will in time pay the current pensions; and then the fund may be considered to be in a satisfactory position.

At this the Jubilee of the fund, it stands as a tried and faithful friend of the Company and its workmen. Some of the young members may live to see its Centenary 50 years hence; and I hope and believe they will be able to bear testimony to its continued beneficence, and to rejoice that there were those who 100 years previously had the good sense and the kindness of heart thus to solve for the South Metropolitan Gas Company's employees the question of old-age pensions in a manly and independent self-help manner, vastly better and more satisfactory than it could have been done, as the Socialists desire, by any Government or State.

OIL AND COAL FIELDS OF AUSTRALIA.

The "Daily Telegraph" says: "Immense shale-fields, the largest known in the world, some 100 miles from Sydney, are about to be developed by an English Corporation, in connection with the manufacture of lubricating and burning oils. So important is the establishment of this industry considered in Australia, that the Premier of New South Wales, in his financial statement in September of this year, speaks of the industry as 'one of the largest ever established in Australia.' Every assistance possible is being given to further its progress. Many millions of tons of the richest shale known in the world are deposited in the fertile and well-watered valleys of Wolgan and Capertee. A railway of about 27 miles is now being constructed to link up this fertile region with the Government main trunk lines. In addition to the shale deposits, the territory is rich in other minerals and timber. Electrical ore-cutting machinery is now in operation making a tunnel of about 3 miles long through the heart of a mountain containing throughout its length rich deposits of shale. By means of this tunnel, the shale will be brought into direct communication with the extensive retorts and refineries about to be constructed, also with the Government main trunk lines and the seaport of Sydney. The Corporation which is operating this great Colonial industry will largely manufacture lubricating and burning oils, sulphuric acid, sulphate of ammonia, petroleum, and paraffin wax. The export trade of Australia will be increased through the exportation annually of hundreds of thousands of tons of shale to Europe and other parts of the world in connection with the manufacture of gas. According to the highest authority on coal gas, this shale gives the greatest quantity of gas and the highest illuminating power known." In Mr. Edward F. Pittman's work on "The Mineral Resources of New South Wales" (issued in 1901), he incidentally refers to the special value for gas making of some of the coal of the New South Wales field.

In connection with this subject, the Agent-General for New South Wales has kindly forwarded to us the following statement, showing the quantity of coal used and gas made in Australia in 1903:—

State.	Coal Used. Tons.		Gas Produced. Cubic Feet.
New South Wales	212,059	..	2,487,807,000
Victoria	166,018	..	1,628,889,400
Queensland	35,270	..	328,698,400
Western Australia	5,580	..	54,434,300
Tasmania	10,865	..	106,004,900
New Zealand	80,610	..	786,531,150

It will be seen from these figures that, in 1903, the average yield of gas per ton of coal carbonized was highest in New South Wales; being about 11,730 cubic feet. The average of the other States gravitated from about 9800 to 9300 cubic feet—the last three-named States each showing an average of approximately 9700 cubic feet.

METROPOLITAN WATER BOARD.

Conversion of Irredeemable Debenture Stocks—Statistics of Supply in October.

At the Ordinary Meeting of the Metropolitan Water Board on Friday—Sir R. M. Beachcroft in the chair—the Finance Committee presented a long report on the subject of the conversion of the irredeemable debenture stocks of the Metropolitan Water Companies into water stock, under the provisions of section 7 of the Metropolis Water Act, 1902. The stocks referred to carry interest varying from 4 to 5 per cent., and they total to £4,365,110. The Committee had ascertained that the amount of the Board's "A" stock which it would be necessary to issue to produce the same income as that derived from the above-named sum would be £6,060,164; and they recommended (*inter alia*) that it should be supplied to the holders on April 2, 1906. In the case of the East London Company, the stock carries interest at the rate of 4½ per cent., and it has been paid free of income-tax. For the £654,740 of this stock the Committee proposed to substitute £1,020,374, which would give each holder such an amount of "A" stock as would bring in £4 13s. 6d. per cent., from which the Board would deduct the income-tax. To their proposal an amendment was moved to refer it back to the Committee for further report as to the amount of stock to be issued. After some discussion, however, the amendment was lost; and the Committee's recommendations were adopted.

The Works and Stores Committee presented a statement relating to the supply of water in the month of October. It showed that the total average daily supply was 213,468,000 gallons; the number of houses supplied being 1,037,382, and the total estimated population 6,757,167. The mean supply per head per day was 31·59 gallons, against 33·46 gallons in October of last year. The quantity of water in store in impounding reservoirs at the end of the month was 5103 million gallons. There were 1713 additional supplies laid on, and 11,992 yards of mains were laid.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The action taken so promptly by Mr. W. R. Herring, of Edinburgh, to bring combined action on the part of the owners of gas-works in Scotland to bear upon the Home Office in the matter of the proposed regulations for the use of locomotives and waggons upon private sidings, bids fair to be crowned with success. A meeting of what is designated as the Associated Scottish Gas Corporations (though the Association exists as yet for only the one purpose) was held in the Board-Room of the Edinburgh and Leith Gas Commissioners yesterday—Judge Bryson, of Leith, presiding—at which there were present the representatives and the gas engineers of the towns concerned. The third draft regulations issued by the Home Office were submitted and discussed. It was agreed that the new draft regulations under consideration had been so materially modified, as compared with the original, that, subject to certain alterations of phrase which would more clearly convey their meaning, they were such that the Associated Corporations had no desire to further oppose them, provided they were established in their present form, and that no material alteration in their character was made by the Commissioner in his recommendations to the Home Office. It was further resolved to seek an interview with the Home Office authorities, with a view to their acquiescing in the proposed phraseological amendments, before the Corporations' case was considered at the resumed inquiry on the morning of the 13th inst.

In the Alloa Town Hall this week, an exhibition of gas appliances has been held, which is worth more than a passing notice. The firms exhibiting were Messrs. Fletcher, Russell, and Co., Limited; John Wright and Eagle Range, Limited; R. & A. Main, Limited; Richmond Gas Stove and Meter Company, Limited; and Falk, Stadelmann, and Co., Limited. Of the productions of these firms it is unnecessary to write; but there was another stand, occupied by the Corporation of Alloa, in which they became exhibitors of articles illustrative of the arrangements for the supply of gas in their own town. This most interesting collection included models of the different apparatus in use; a chart showing the increase in the gas consumption, dealing with different periods, and the average daily consumption for these periods; the apparatus used in the gas office for counting coppers; gas-meters, wet and dry, of various sizes; and a variety of bye-products, in glass vessels. The exhibition was opened on Tuesday afternoon by Councillor Duncannon, who has been appointed Convener of the Gas Committee, in room of Provost Arrol. He said it was eighty years since gas was introduced into Alloa. At that time, there being no meters, the charges for gas were: From sunset till eight o'clock, 10s. a year; from sunset till nine o'clock, 15s.; and from sunset till ten o'clock, 20s. Then everybody went to bed. In 1877, when the Corporation took over the gas supply, the annual consumption of gas was 20 million cubic feet; it was now 102 millions. The capital account in the Gas Department had risen from £25,000 to £33,000. They were fortunate in having such an able Manager as Mr. Napier, under whose guidance the undertaking was steadily increasing. They had recently added the system of supplying free cookers to consumers, with the surprising result that at the present time there were in use 1370 gas-cookers, compared with 904 six months ago. While they did not supply gas-fires free, as they did cookers, they were prepared to supply them at liberal discount rates, and to fit them free of cost to all purchasers. On Thursday evening, Mr. J. W. Napier, the Manager, delivered to a large audience in the exhibition an illustrated lecture upon "All About Gas: How it is Made, and How to Use It." In introducing the lecturer, Provost Arrol recalled that in Alloa they had the second cheapest gas in Scotland, and said that this, together with the great efficiency in the management and control of the gas undertaking, reflected the highest credit both on their late Manager (Mr. S. Yuill, now of Dundee), and his successor, Mr. Napier.

Hitherto neither of the Districts into which the Scottish Junior Gas Association is divided have gone beyond their own ranks, until to-night, to find material for their own entertainment and advancement. One of the purposes of the Association is to employ lecturers; and the Western District to-night availed themselves of that provision to call in the services of ex-Bailie Burt, of Glasgow, to lecture to them upon the gas-engine. Mr. Burt is, I should say, the best qualified man in Scotland to deal with such a subject, having been a patentee and designer of gas-engines from an early date, and being now at the head of the Acme Gas-Engine Company, Limited, of Glasgow. Assuredly, the District have much reason to congratulate themselves upon the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 741.

Issue.	Share.	When last Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	20⅛—21⅛	..	4 17 8
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 31	14	Bourne- } 10 p.c.	29—30	..	4 13 4
51,810	10	,,	7	mouth Gas } B 7 p.c.	17—18	..	3 17 9
53,200	10	,,	6	and Water } Pref. 6 p.c.	15⅛—16⅛	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	258—263	..	4 15 1
300,000	,,	,,	9½	Do. New	197—202	..	4 14 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
206,250	,,	June 15	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Sept 15	11¼	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk.	160—165	..	5 0 0
460,000	20	Sept. 28	10	British	42½—43½	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c.	120—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	90—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12⅛—12¾	..	5 9 10
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
150,000	20	July 13	8½	Cagliari, Ltd.	24—20	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p c Pref.	10—10⅜	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,434,680	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk.	116—118	..	4 8 1
560,000	,,	,,	5	Do. 3½ p.c. do.	112—114	..	4 7 9
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6¼	Continental Union, Ltd.	128—131	..	4 19 3
200,000	,,	,,	7	Do. 7 p c Pref.	145—150	..	4 13 4
424,070	Stk.	—	5½	Derby Con. Stk.	125—127	..	4 6 8
55,000	,,	June 3	4	Do. Deb. Stk.	108—110	..	3 12 9
486,090	10	July 28	11	European, Ltd.	22—23	..	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
15,223,235	Stk.	Aug. 16	4⅛	Gas- } 4 p.c. Ord.	101⅛—102½	+⅛	4 5 10
2,600,000	,,	,,	3½	light } 3½ p.c. max.	87—91	−1	3 16 11
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	110—112	−½	3 11 5
4,193,975	,,	June 15	3	Coke } 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	98—101	..	4 19 0
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental	234—236	+½	4 4 9
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	123—128	..	4 13 9
561,000	Stk.	Aug. 16	10	Liverpool United A.	234—236	..	4 4 9
718,100	,,	,,	7	Do. do. B.	172—174	..	4 0 6

Issue.	Share.	When last Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	,,	5	Malta & Medn., Ltd.	4⅞—5	..	5 0 0
560,000	100	Oct. 2	5	Met. of } 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 15	3½	Monte Video, Ltd.	11½—12½	..	5 12 0
1,565,892	Stk.	July 29	4⅜	Newc'tle & G'tesh'd Con.	107—108	..	4 5 8
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	100—102	+1	3 8 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	147—150*	..	5 6 8
600,000	5	Sept. 14	7	Ottoman, Ltd.	6—6½	..	5 7 8
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord.	7—7½	..	4 0 0
796,980	5	July 28	5	Do. 5 p.c. Pref.	5⅝—5⅞	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99*	+1	4 0 10
851,070	10	Oct. 13	7	River Plate Ord.	12⅞—13½	..	5 5 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Sept. 28	7	San Paulo, Ltd.	13—13⅜	..	5 3 8
70,000	50	July 1	5	Do. 5 p.c. Deb.	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,498	,,	,,	10	Do. C	244—246	..	4 1 4
126,196	Stk.	Aug. 31	5⅛	Shrewsbury Ord. 5 p.c.	110—120	..	4 11 8
70,000	10	Sept. 28	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Aug. 16	5⅜	South Met., 4 p.c. Ord.	132—134	..	4 2 1
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,020	Stk.	Aug. 16	5⅜	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord.	109—112	..	4 9 3
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¾	Tottenham } A 5 p.c.	125—128	..	4 17 8
363,020	,,	,,	4¾	and } B 3½ p.c.	99—102	..	4 13 2
125,000	,,	June 23	4	Edmonton } 4 p.c. Deb.	107—110	+2	3 12 9
182,380	10	June 15	8	Tuscan, Ltd.	9⅜—10½	..	7 16 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Aug. 16	7⅜	Wands- } A 5 p.c.	—	..	—
255,636	,,	,,	6¾	worth } B 3½ p.c.	137—140	..	4 9 3
60,000	,,	,,	5 17/20	and } C 3½ p.c.	113—116	..	4 13 6
57,564	,,	June 29	3	Putney } 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord.	106—108	..	4 12 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex. div."

work of the evening. The lecture will undoubtedly be exceedingly helpful to most of those who heard it. The discussion, too, which the lecturer allowed upon his remarks was the best sustained and most instructive of any which has yet been experienced in the Scottish Junior Association. Particularly useful, at the same time, will be the remarks of Mr. Burt in reply.

At a meeting of the Leith Town Council on Tuesday, the Medical Officer of Health reported, regarding the complaints by residents in the Trinity district of smells from the gas-works, that his opinion of a year ago still held good, which was to the effect that "while to most people these odours were harmless, yet it must be admitted that there were those whose health might be affected." He held to this opinion, and was convinced that the smells from oxide of iron were a nuisance within the meaning of the Public Health (Scotland) Act, 1897.

The Cleaning and Lighting Committee of the Edinburgh Town Council on Tuesday recommended the removal of the Nernst electric lamps which had been erected in Forth Street, Union Street, and Argyle Place for the purpose of experiment. These lamps were put up on the application of the Electric Lighting Committee, who were desirous to show that they could furnish street lighting at a cheap rate, and so counteract the drift of the Town Council towards the lighting of the city by incandescent gas-lamps. After some discussion, it was agreed to continue the experiments with the Nernst lamps; and the report was re-committed.

Two years ago, the Corporation of Glasgow authorized the construction of a conduit for containing gas and water pipes and electric cables. The matter was entered upon more as an experiment than even as a first instalment of a general system. Nelson Street, a very narrow thoroughfare leading from the Trongate northwards, was selected as the scene of the experiment. It is now reported by the Master of Works that the conduit has been completed. The conduit is 115 yards in length, 6 ft. 6 in. wide, and 7 ft. high. In it there have been laid two 8-inch gas-mains, a 7-inch water-main, three hydraulic power supply mains, and two 3-inch electricity mains. There are 73 cross connections laid from the conduit to the kerb. The total cost of the conduit, including those cross connections and the electric lighting of the conduit, has been £1219.

The popular statement to the effect that the shoemaker's wife and the blacksmith's mare are usually the worst shod, was surely exemplified in a fire which took place in a shop in Union Street, Aberdeen, on the morning of Sunday last. The premises were those of a firm of plumbers and brassfounders. In such a place it might have been expected that the system of gas-pipes and electric wires would have been as perfect in arrangement and in construction as possible. Yet what was found by the Fire Brigade was that in the cellar a gas-pipe was in contact with the electric fittings, and near a wooden beam in the roof. The wire carrying the electricity had got heated, had melted the gas-pipe, and had set fire to the wooden beam, which had, in turn, ignited the escaping gas. The fire was early discovered; and the damage did not amount to more than about £100.

The output of gas at Stevenston, Ayrshire, has been increasing at the rate of about 18 per cent. per annum during the past five years. To enable them to meet the demand, the Stevenston Gas Company, Limited, have erected a new gasholder, of 50,000 cubic feet capacity. The tank is a wrought-iron one, upon a concrete bed, and all above ground. This is the fourth holder of the same kind in Ayrshire. Mr. J. Napier Myers, of Saltcoats, was Engineer for the work; Messrs. Edward Cockey and Sons, of Frome, Somersetshire, were Contractors for the ironwork; and Mr. T. Borland, Stevenston, was Contractor for the concrete work. Gas has been turned on from the holder to the mains this week, and afterwards the company who witnessed the ceremony sat down to dinner.

On Friday of last week, Bailie Sim, the Convener of the Gas Committee of the North Berwick Corporation, and Mr. J. Black, the Gas Manager, visited Dunbar, where they were shown over the Dunbar Corporation Gas-Works by Provost Smith, the Gas Convener, and Mr. T. O'Neil, the Gas Manager there.

Proposed Water-Works Extensions at Alfreton.

A short time since, the Alfreton Urban District Council called in Mr. W. H. Radford to advise them as to the best means of improving the water supply, which in very dry weather is not at present equal to the demand. Mr. Radford has now prepared his report; and it is to be discussed at a special meeting of the Council to-day. He estimates the present population at 18,000, and the water requirements at 200,000 gallons a day, including that sold to the Midland Railway Company. The Council have about 541 acres in all in the watershed, which should yield about 154 million gallons per annum. The quantity of water used last year was 91 million gallons, of which probably 80 million gallons was drawn from this watershed; the remainder being pumped from elsewhere. There should thus be a surplus available for additional storage. Mr. Radford suggests a new reservoir and filter-beds at Lindway, and a 9-inch main to carry the water to the town. The cost of this work would be £24,650. He also deals with an alternative scheme for extending the Butterley reservoir; but the cost of this, for works alone, would be £12,560, while it would only provide storage for an additional 5 million gallons, as against 16 million gallons under the first-named arrangement. He concludes by remarking that he had hoped the Butterley extension would be the cheapest and best; but the figures and points are against it. It is Mr. Radford's opinion that pumping can be entirely done away with in connection with the Alfreton supply.

Mr. M. Ratcliffe Barnett, M.Inst.C.E., who may be known to some of our readers from his connection with several large schemes of water supply during the past seventeen years, has commenced practice as a civil engineer at No. 124, St. Vincent Street, Glasgow.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 8,150,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

CURRENT SALES OF GAS PRODUCTS.

Week ending Dec. 9.

The London market for coal tar products has experienced but little business, and practically no change in prices during the past week. Pitch deliveries are being well taken up. Crude carbolic 60's is rather stronger, and 1s. 9¾d. net has been paid; while 90 per cent. benzol has been done at 10¼d. net. Sulphate of ammonia remains in a somewhat dull state, though there are plenty of inquiries for the early months of 1906. The nominal quotation is £12 15s. on Beckton terms for December.

LIVERPOOL, *Dec.* 9.

Sulphate of Ammonia.

The market has again been quiet, without material change in values; the closing quotations being £12 6s. 3d. per ton f.o.b. Hull, £12 8s. 9d. per ton f.o.b. Liverpool, and £12 11s. 3d. to £12 12s. 6d. per ton f.o.b. Leith. There has been more direct buying; but supplies have been plentiful, and in some cases resales have been reported at prices below current quotations. Further business is reported to have been done abroad at about the equivalent of £12 12s. 6d. per ton f.o.b. U.K. ports for delivery over spring months; but this seems for the most part to have been taken speculatively, makers' views being rather higher.

Nitrate of Soda.

This article is quiet on spot at 10s. 9d. per cwt. for ordinary and 11s. for refined quality.

LONDON, *Dec.* 9.

Tar Products.

There has not been much business doing during the past week, and prices have been generally easier all round. There is, however, still a good demand for carbolic acid. Business is reported in 60's at 1s. 9½d. for December; while makers now ask 1s. 10d. for January-June. Some quantity of 50's is reported to have been sold at 1s. 6d. to 1s. 6½d., according to place of shipment. There is a fairly good inquiry for 75's, principally for home consumption; and one or two of the principal manufacturers certainly prefer producing this quality to any other, although the German consumers do not appear at all anxious to purchase same, and only offer prices which are considered quite out of proportion to those ruling for 60's. In crystals there is nothing fresh to advise, and markets are quiet all round. In 90 per cent. benzol there is no fresh business doing; but there are sellers at 10d. for forward delivery, and there appears to be a general opinion that prices may be a little easier later. 50-90 per cent. still remains firm, and there is a fairly good demand from the Continent for same. Makers here, however, do not appear to be offering anything just at the moment, and will not consider any business at under 10½d. Some business is reported in toluol for January-June for home consumption, at a price equal to 11d. f.o.b.; but, as a rule, manufacturers ask rather more than this. Solvent naphtha is still firm, but there is certainly more offering for forward delivery, both in London and the North. For creosote, the demand is not quite so good so far as London is concerned; and there is certainly more offering. Yorkshire makers appear fairly well sold, and, as a rule, are asking rather over 1½d. for forward delivery. Lancashire manufacturers do not appear to be offering any just at the present time, and evidently they must have made large sales, which have relieved their stocks for the time being. The market for pitch is decidedly quiet, and consumers do not appear at all anxious to purchase for early delivery; while as regards January-June, business is only possible at a reduction in value. London makers' still quote 35s.; but dealers are reported to be offering at something under this for both prompt and forward delivery. In Yorkshire, there is no business of importance to report. There are still sellers at 34s. 6d.; but neither dealers nor consumers are prepared to pay this price forward. As regards South Wales, there is still a good inquiry for January-June; but business is at present impossible, owing to the prices offered by consumers being very much under the ideas of either dealers or manufacturers.

The average values during the week were: Tar, 18s. to 22s. 6d.; Pitch, London, 34s. to 34s. 6d.; east coast, 33s. to 34s.; west coast, 32s. to 32s. 6d. Benzol, 90 per cent., 10d.; 50-90 per cent. 10¼d. to 10½d. Toluol, 11d. to 11½d. Crude naphtha, 4½d.; solvent naphtha, 10½d. to 11½d.; heavy naphtha, 11d. to 11½d. Creosote, London, 1⅞d. to 2d.; North, 1⅞d. to 1½d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 9¼d. to 1s. 9½d. Refined naphthalene, £4 10s. to £9; salts, 18s. to 20s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market is quiet, but there is still a fairly good inquiry for forward delivery. Beckton still quote £12 17s. 6d. for January-June, and are reported to have declined business at £12 15s. Business in Hull has again been done at £12 10s. for December delivery, and there are still buyers at this price for January-March. In Leith, makers still quote £12 12s. 6d., although there are second-hand sellers at £12 11s. 3d.; but consumers are not prepared to pay more than £12 10s. In Liverpool, there has been a fairly good business doing at £12 10s. for early shipment; and there is certainly an improved inquiry from this port.

Serious Acetylene Explosion at Ipswich.—Severe injuries were sustained by Mr. W. Clarkson, an Ipswich plumber and gas-fitter, last Tuesday, through an explosion while testing an acetylene gas plant in the workshop at the rear of his business premises. Mr. Clarkson was removed to the hospital, suffering from injured face, arms, and hands; while the roof and sides of the workshop were shattered.

What is The New Gas-heating Boom?

The Fresh *Gas-selling* Channels opened up by the Gas-heated Steam Radiator.

To share in the Boom, you want to put the "ST. ANDREW" on Simple Hire.

Which is *THE* Gas-heated Steam Radiator?

WRIGHT'S "ST. ANDREW."

COAL TRADE REPORTS.

Lancashire Coal Trade.

There is no change really to report in the coal trade of the County Palatine. Whatever may be doing in particular centres, the trade, as a whole, is on the basis which has prevailed for some time past. Engine fuel is the best and most profitable feature of the market; and although quotations on 'Change remain practically unaltered it is well known that slightly advanced prices are being got for new contracts. House coal remains about the same as for the last few weeks. It is said by colliery proprietors to be the least satisfactory branch of the coal trade. The weather is against large house fires. Cannel contracts are being made, and material sent out both for home consumption and for use in more distant centres, and also for export, by the Manchester Ship Canal. It is very difficult to get at the contract prices for cannel. Neither buyers nor sellers are disposed to supply such information. The Pemberton colliery strike still continues. A recent ballot among the men on the question, resulted in a large majority being in favour of continuing the strike. Last week's quotations hold good for the different qualities of coal.

Northern Coal Trade.

There has been an improved demand for coal, to an extent that has influenced some of the prices beneficially. Shipments have been fuller; and the foggy weather has enlarged the demand for gas coal and other kinds. Steam coals are now more active, and there is the desire to stock fuel that is often found before the great holidays. Best Northumbrian steams are steadier at 9s. per ton f.o.b., second-class steams are 8s. 3d., and steam smalls are 5s. 3d. to 5s. 9d. Unscreened steams are more in demand. In the gas coal trade, this is, of course, the month in which the consumption is about at the highest point, and deliveries are very heavy on the southern contracts, so that there is not much coal free for sale; and thus prices are firmer for early delivery. Durham gas coals vary from 8s. 6d. to 9s. 3d. per ton f.o.b., according to quality. Some contracts have been made for export over next season, at nearly midway between these prices; but no large sales have of late been made. In the coke trade, demand is very good; and, in sympathy, gas coke is firmer, in spite of the very heavy production that is now being made. From 10s. 6d. to 11s. per ton f.o.b. is the quoted price at Newcastle; but the position of the gas coal trade makes the values very irregular.

Scotch Coal Trade.

There is still great activity in trade, but no further advance. All classes of fuel are moving off briskly. Steam coal continues in better demand. The quotations are: Main 7s. 6d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 6d., and splint 9s. 6d. to 9s. 9d. The shipments for the week amounted to 235,639 tons—a decrease of 11,299 tons upon the previous week, and of 22,540 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,457,536 tons—an increase of 602,542 tons upon 1904.

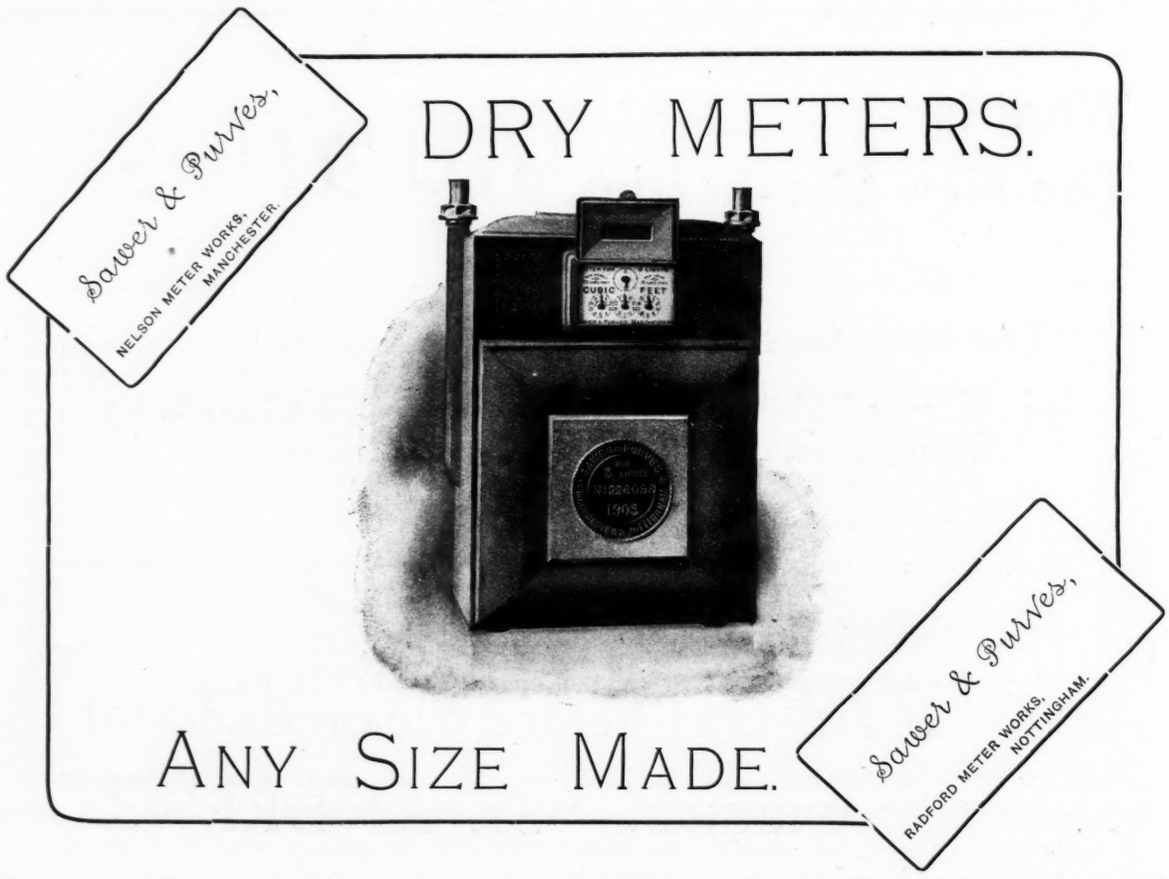
New Issues of Gas and Water Capital.

During the past week, there were four new issues of capital to be employed in connection with the supply of gas and water. Taking them in their order, on Monday, the tenders invited in our columns by the Tottenham and Edmonton Gas Company for an issue of £12,500 of 4 per cent. debenture stock were opened. Altogether 51 tenders were received—the amount applied for being £42,165; so that there was an excess of £29,665. The prices ranged from £103 to £105 per £100; and the lowest accepted was £104 5s. Seven allotments in all were made, at an average of £104 11s. 1·44d. The next day, Mr. Alfred Richards sold, at the Mart, Tokenhouse Yard, E.C., by order of Directors, new issues of perpetual debenture stock of the Commercial and Crays Gas Companies and the Southend Water Company. The amount of the first-named issue was £25,000 of 3 per cent. stock, and was all placed at £83 to £84 5s. per £100. The Crays Company's new issue was £5000 of 4 per cent. stock, which was sold at from £100 to £101 per £100. The Southend Water Company issued £10,824 of 4 per cent. stock, for which Mr. Richards obtained prices ranging from £106 5s. to £107 10s. per £100.

Reduced Price for Power Gas at Wandsworth.

In the "JOURNAL" for the 14th ult., we announced that the Wandsworth and Putney Gas Company intended to reduce their price to 2s. per 1000 cubic feet after the 1st of January next. We learn from a circular just issued, that this price will be subject to a discount of 10 per cent. (bringing the net cost to a trifle over 1s. 9½d. per 1000 cubic feet) in the case of gas used for engines, furnaces, forges, blast-burners, washers for laundries, &c. The condition attaching to this concession is that the gas must be registered by a separate meter, and that the Company's officers shall have access to the pipes, fittings, connections, &c. The Company in their circular call attention to the relative cost of gas and electricity for power. An electric motor requires 8½ units, at 1½d., or 1s. 0¾d. per hour; whereas a 10-horse power gas-engine requires 200 cubic feet of gas, which, at 1s. 9·6d. per 1000 cubic feet (2s., less 10 per cent.), comes to only 4½d. per hour. They also point out that, apart from the danger of suction gas, the power obtained from it is less than one-fifth that given by ordinary coal gas. Should electric lighting be wanted, consumers will find that current can be produced by a gas-engine and dynamo at about ½d. per unit, under the Company's new terms to users of gas for power.

Price of Gas to Prepayment Consumers at Blackpool.—A member of the Blackpool Town Council having given notice of motion that the price of gas to users of prepayment meters should be reduced from 3s. 4d. to 2s. 9d. per 1000 cubic feet, it was decided that the Gas Committee should deal with the matter.



Crediton Gas Company and Electric Lighting.

A special meeting of the Crediton Urban District Council was held last week to further consider the question of the proposed application to Parliament by the Crediton Gas Company for power to supply electricity as well as gas. In their original communication to the Council at the end of October, the Directors of the Company pointed out that Messrs. Christy Bros. and Middleton, of Chelmsford, who had obtained a Provisional Order for supplying electric light at Crediton, had failed to exercise their powers, and that the Order had consequently lapsed. It was doubtful, the Directors thought, if any separate Company would care to take up the electric lighting business in Crediton; but it might be combined with gas lighting, as had been done in some other small towns. On receiving this communication the Council passed a resolution generally approving of the proposals of the Company to provide electric lighting, but expressing no opinion as to the details of the measure, pending a perusal of the draft Bill. Since then Messrs. Christy Bros. and Middleton have been in communication with the Council; and as the result this special meeting was called. Mr. W. B. Berry now said he thought the previous resolution had been passed without sufficient consideration; and he moved that it be rescinded. If they allowed gas and electricity to be supplied by one Company, there would be an end to all question of competition in the future. The previous resolution was rescinded. A letter was read in which Messrs. Christy Bros. and Middleton reminded the Council that they had approved of the firm's application for electric lighting powers, and stated that they intended to apply for a renewal of the Provisional Order. Mr. H. Elston said he was opposed to the same Company having a monopoly of both systems of lighting; and it would be in the best interests of the town to oppose the Bill. It was unanimously decided to oppose the Company's application with reference to the electric light, and to support that of Messrs. Christy Bros. and Middleton, on the ground that the Council had already approved their scheme.

Electric Lights for Sutton.—The Sutton Urban District Council have accepted the tender of the South Metropolitan Electric Tramways and Lighting Company for the lighting with electric lamps of the various streets through which their cables run. The whole of the street-lighting contract has, it is stated, been held by the Gas Company for over thirty years; but on this occasion the Electric Company underbid them to the extent of 1s. 6d. per lamp, and undertook to give at least double the lighting.

West's Stoking Machinery at the Hanover Gas-Works.—A contract has just been placed with West's Gas Improvement Company, Limited, for a complete installation of compressed-air stoking machinery and coke-conveying machinery for a retort-house at the Hanover Gas-Works, which will be re-modelled early next year. The machinery will practically be a duplicate of the stoking machinery installed and put into operation at the works early in the present year, and of West's coke-conveying machinery which was put into operation in October.

Theft of Gas at South Shields.

At South Shields, last Friday, a man named Jefferson was sent to prison for six months for "having laid, or caused to be laid, a pipe communicating with another pipe for conveying gas" to a house and shop, and for having stolen gas. The shop was fitted with a prepayment meter; and the allegation was that defendant had removed a cock from the end of the service-pipe which led to the meter, and had attached some lead piping in such a manner that the premises were supplied with gas direct from the main without the consumption being recorded. To avoid being found out, it was alleged that he from time to time connected the old pipe to the meter, which thus indicated some consumption of gas. The defendant pleaded guilty to larceny, but denied that he connected the piping. Mr. Newlands, for the Gas Company, said that the theft had been going on, as far as they could ascertain, for some time; and he was instructed to press for severe punishment. It was estimated that there had been at least £9 worth of gas consumed that had not been paid for over a period of eighteen months.

More Incandescent Gas Litigation.

Last Wednesday, Lords Justices Vaughan Williams, Stirling, and Cozens-Hardy heard an appeal by the plaintiffs in the action of *New Inverted Incandescent Gas-Lamp Company, Limited, v. New Export Incandescent Lighting Company, Limited*, from an order of Mr. Justice Joyce (*ante*, p. 550), refusing a stay until after the appeal in an action by the same plaintiffs against the Globe Light Company had been heard. Mr. Fletcher Moulton, K.C. (with him Mr. Gordon), stated that at the trial of the Globe action the attack on the validity of the plaintiffs' patent was abandoned; but the Judge held that the defendants' lamp was not within the scope of the patent, and consequently there had been no infringement. From this decision the plaintiffs had appealed, and the case was now about thirteen out of the list. In the present action, the plaintiffs realized that so long as the decision appealed against stood, they could not contend that the lamp made by the New Export Company was not covered by the decision as to non-infringement; and therefore they offered that this trial should stand over until the Globe appeal had been heard—the plaintiffs being willing that, if they were unsuccessful on the appeal, they would consent to judgment being entered for the defendants on the question of infringement, and if successful the defendants were to be in no way bound by the judgment. Under these circumstances, he suggested that there should be a stay, so that the parties should not be put to unnecessary expense. Mr. Gray, for the defendants, strongly objected to any delay, as their business was, he said, being injured by the pendency of the actions; purchasers being unwilling to take the lamps owing to threats that actions would be brought against them. He further urged that the Globe appeal did not affect his case at all, as his lamp was totally different from that of the Globe Company. In the result, their Lordships granted the stay, on terms which Counsel were to agree and endorse on their briefs.

Two Authorities

Sir W. B.
RICHMOND
K.C.B., R.A.,
L.C.C.

The
RICHMOND
GAS STOVE
& METER CO., LTD.

On Smoke Abatement.

See **RICHMOND'S STAND**—Royal Sanitary Institute's **SMOKE ABATEMENT EXHIBITION,** Horticultural Hall, Vincent Sq., Westminster, S.W.
December 12, 13, 14, and 15.

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD. LONDON: 132, QUEEN VICTORIA STREET, E.C. WORKS & OFFICES: WARRINGTON & STRATFORD.

An Unfortunate Reservoir Scheme at Soyland.

The Soyland Urban District Council have had an unfortunate experience in connection with a new reservoir. It was constructed to hold about 5⅔ million gallons of water; the cost being £15,750. Afterwards it was found that at one corner the reservoir was leaking. The Council were compelled to apply to the Local Government Board for a further loan of £2000 to remedy the defect—the contractor, it is stated, having meanwhile failed. During the inquiry which was consequently held, it was elicited that since the scheme was originally adopted there had been a decrease in the population and the rateable value of the district. The Inspector (Mr. R. H. Bicknell) expressed curiosity as to why, on a contract of over £15,000, the Council only got security for £500. The evidence also showed that the plant approved by the Local Government Board had been altered without the sanction of the Board. The Inspector said that when the Board agreed to the loan, they had considerable doubt as to whether or not the reservoir would be actually water-tight; but they believed reasonable provision had been made. The design had, however, been altered; and he thought it greatly due to this, and to the work not being carried out satisfactorily by the contractor, that the Council were in the dilemma of wanting £2000 to remedy the defects in the reservoir.

Gas Profits at Loughborough.—The past six months has been a satisfactory period for the Loughborough Gas-Works; the profit having amounted to £2099, as compared with £1563 for the corresponding half of the previous year. Notwithstanding the competition of the electric light, the number of gas consumers continues to advance; the period under review having furnished an additional 300 customers, mostly on the prepayment system. The consumption of gas also shows an increase of 6 per cent.

Price of Gas at Portadown.—A member of the Portadown Urban District Council lately called attention to the "numerous complaints" that were being made as to the "wretched quality of the gas." He observed that in Newtownards the price had been reduced 8d. per 1000 cubic feet. Coal was much cheaper now than it was some time ago; and he thought the Company should be able to give them better gas at a less rate than they were charging. He moved that a deputation be appointed to wait on the Directors in reference to the matter. This was agreed to.

Criccieth Water Supply.—The Criccieth Urban District Council are proposing to embark on a scheme of water supply which, besides providing for an additional quantity, includes the purchase of the Water Company's undertaking. A friendly arbitration has been agreed to between the parties; but there is considerable difference in the ideas of the value of the works—the Council offering £3000 and the Company asking £9000. It is said that the new source will, in dry weather, yield a supply sufficient for a population six times that of Criccieth. At a public meeting, the ratepayers unanimously expressed their approval of the scheme.

Water in the Karoo.—A success in boring for water has been achieved in the arid district of South Africa known as the "Karoo." The water was struck at a depth of 27 feet. Mr. Riley, who is in charge of a Government drill, computes the quantity obtainable per day at 100,000 gallons. The water runs from the borehole through a stint for a distance of several hundred feet, at the end of which an air-motor will distribute it for irrigating a large area of land. Water has also been found on a farm at Uitslugtsfontein. Mr. J. F. Theron has been working on this farm with his jumper drill, and has struck a supply of about 120,000 gallons per day at a depth of 50 feet.

Nearing the End of the Birmingham Welsh Water Scheme.—Alderman Lawley Parker was last week able to inform the Birmingham City Council that, after twelve years' work, the Caban dam was completed; and they could now hope that the reservoir would soon begin to fill, thereby adding 7000 million gallons to the storage. Referring to the approaching completion of other works, he said that by June 30 next they hoped to be at end of the capital expenditure on the first instalment of the works. He paid a tribute to the high standard of personal honour shown by the late Mr. Mansergh in all his dealings with the Council, and particularly his willingness to allow the Water Committee to decide all matters of account relating to his remuneration.

Price of Gas and Electricity to Large Consumers at Coventry.—The Special Committee appointed to inquire into the price of gas and electricity to large consumers at Coventry have issued a report, in which they recommend that no alteration should be made in the present charges; their opinion being that it would be wrong to supply either gas or electricity at a lower figure than it cost to produce. The Town Council adopted the report; but several members expressed disappointment at the Committee's decision. Alderman Fowler thought both gas and electricity could be produced at a less cost, and a profit still be made. The Mayor, however, stated that a reduction in price would involve a large capital outlay in the Electricity Department; and it was the opinion of some of the councillors that the Corporation should not enter on this expenditure for private purposes.

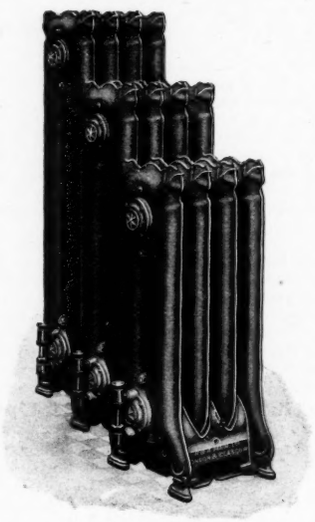
Pumping by Gas at Middlesbrough.—A pumping-station has just been opened at Middlesbrough, in order to cope with the serious floods which have hitherto occurred, during heavy and continued rains, when the River Tees has been at high tide. In the engine-house provision is made for a duplication of the pumping-plant, which it is intended to lay down for use in case of accident. The deliveries from the two pumps now fixed are coupled up to a 3 ft. 6 in. pipe, which in turn connects with a 5 feet diameter delivery main 500 feet long, at the junction provided for a duplicate set. The pumps are driven by two single-cylinder horizontal gas-engines; and each pump is capable of delivering 15,000 gallons of water per minute through a total lift of 16 feet. The whole of the work has been designed and carried out by Mr. Frank Baker, the Borough Engineer, and his Chief Assistant, the late Mr. T. D. Cooper.

THE "MAIN"

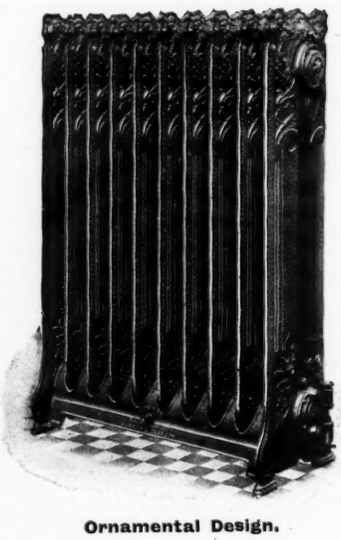
"ST. MUNGO"

Gas-heated

STEAM RADIATORS.



Plain Design.



Ornamental Design.

FITTED WITH EVERY MODERN IMPROVEMENT.

Write for Prices.

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LONDON, GLASGOW, & FALKIRK.

Stockport Gas Inquiry.—At the monthly meeting of the Stockport Town Council, a question was asked which bore on the recent report of a Special Committee as to the financial control of the Gas Department. The recommendations were set forth in the "JOURNAL" for Oct. 10 (p. 123); and the question asked (by Alderman Ferns) had reference to the salary of Mr. T. Bedford, the Gas Secretary. Alderman Clarke, in reply, said he did not think the question should have been put at the Council meeting; and he should absolutely decline to answer it. Alderman Ferns must wait and see what the Committee were going to do in the matter. This would be stated on the minutes in the month of January.

Seaforth Gas Poisoning Fatalities.—The minutes of the Health Committee submitted at the monthly meeting of the Waterloo-with-Seaforth Urban District Council contained some reference to the recent gas poisoning cases in the locality, when two lives were lost (*ante*, pp. 562, 631). The Clerk reported that the Chairman (Mr. W. C. Rawlins) had authorized a sample of gas to be taken and analyzed, which was approved. The analysis indicated the presence of 10 per cent. of water gas. The Clerk was instructed to inquire of the Liverpool United Gaslight Company whether it was possible to reduce the quantity of water gas used, and to suggest that while the Company continued to supply this gas to the district they should inform their consumers that water gas was mixed with the coal gas, and also of the danger attending escapes through defective fittings or other causes.

Salford Corporation and their Coal Contracts.—In connection with a recommendation of the Gas Committee, that an offer for cannel should be accepted "at a price stated in the proceedings," several members of the Salford Borough Council argued that the price ought to be made public. Alderman Phillips, the Chairman of the Committee, in reply, pointed out that the Committee was a trading committee, purchasing commodities; and there were various interests to be considered. He had his own opinion as to whether there was, or was not, a "ring" against the Corporation, as had been suggested in the debate; but he did not think it was good to make accusations till the necessity arose, and he saw no necessity at present. Other places did not publish their prices. Any member of the Council could examine the books, and satisfy himself as to what was being done.

Unsatisfactory Electric Lamps at Colchester.—The Colchester Chamber of Commerce lately called the attention of the Lighting Committee of the Town Council to the inadequate nature of the present lighting of the principal streets of the borough; and when the matter came before the Corporation, Mr. Sparling mentioned that one Sunday evening he saw more than half-a-dozen Nernst lamps not alight; while Mr. Baker remarked that every night, in one part of the town, two or three lamps were out. Alderman Sanders said that, though on the evening in question he had seen no lamps extinguished, they could not, with a total of 1200 or 1300 lamps, prevent some occasionally going out. It was strange, however, that so many should have failed on this particular Sunday. He supposed that on Sundays gentlemen had nothing to do but to walk round and look at them.

The Birmingham Corporation Gas Department have just placed an order with Messrs. Willey and Co., Limited, for three Livesey washers, each capable of dealing with 5 million cubic feet of gas per diem, one to be erected at each of their stations—Saltley, Nechells, and Windsor Street.

The Torpoint Coal and Gas Company, Limited, has been registered with a capital of £7000, in £1 shares, to acquire the undertaking and all or any of the assets and liabilities of the Torpoint Coal and Gas Company, Limited (incorporated in 1846), and to manufacture, sell, and supply gas or electricity in Torpoint, Anthony, and elsewhere in Cornwall.

Nearly £200 more was spent last year on the public lighting of Felixstowe than was the case in the previous year; the total being £1002, of which £250 was for electricity and the remainder for gas. The charge for ordinary street-lamps, of which there are 213, was advanced 12s. each for the year; the lamps now being lit every night, instead of being extinguished on moonlight nights.

We have received from Messrs. Wood and Co., water-meter manufacturers, of Studley Road, Clapham Road, S.W., their new illustrated catalogue of improved Siemens patent water meters and fittings. The book is very clearly illustrated, and it will no doubt appeal to most engineers as being thoroughly practical; giving details of only necessary parts appertaining to the special work which they execute.

At a meeting of the Birmingham and District Master Gas-Fitters' Association held in Birmingham last Thursday—Mr. Charles Breedon presiding—a deputation attended from the Birmingham and District Ironmongers' Association and further discussed the question of formulating a scheme which could be supported by both the Associations for the purpose of approaching the Gas Committee of the Corporation with the view of having the Gas-Fittings Department now carried on by them abolished. The matter was thoroughly discussed, and an agreement was come to as to the line that should be taken; and the Secretary (Mr. G. H. Tyler) was requested to write to the Chairman of the Committee asking him for an appointment to receive a deputation from the Joint Associations early next month.

The ninth annual entertainment in connection with the employees of the South African Lighting Association, and in celebration of the King's Birthday, was given on the evening of the 10th ult. in the Town Hall, Port Elizabeth, under the chairmanship of Mr. William Arnott, the Association's Manager at the Cape. There was a large and fashionable assembly, and the whole of the proceedings were a distinct success. Whether at work or at play, Mr. Arnott never loses sight of the interests of the Association he serves; and consequently he took an opportunity, during the evening, of giving the audience some facts in connection with the advantages of gas, the extent to which it is consumed at Port Elizabeth, and the facilities afforded by the Association for the inhabitants to avail themselves of these advantages. The programme arranged for the occasion was a most entertaining one; the second part being devoted to an account, by Mr. Arnott, illustrated by limelight views, of his trip to the Victoria Falls.

"CROWN" COOKER

SHOWING HOT-PLATE HINGED TO FACILITATE CLEANING OF BURNERS, &c.

PARKINSON'S

No. 40 LANTERN.

Wind-Proof and Perfect Ventilation.

WRITE—

PARKINSON AND W. & B. COWAN, LTD.

(PARKINSON BRANCH),

COTTAGE LANE, CITY ROAD, LONDON.

BELL BARN ROAD, BIRMINGHAM.

The Richmond Gas Stove and Meter Company, Limited, have sent us one of their very artistic calendars for next year. An olive-green cardboard framework sets off effectively the centre figure of a smiling chef standing behind one of the Company's cookers, which is filled with joint, poultry, and pastry, and surmounted by a goodly array of culinary utensils. Below is a monthly tear-off calendar, with white dates on paper of a shade lighter green than the framework. The picture, which is in bas-relief, is very effective.

Messrs. Bryan Donkin and Clench, Limited, have just received an order from the Nottingham Corporation for a combined exhauster and engine for their Basford Gas-Works, capable of passing 200,000 cubic feet per hour. They have also in hand a number of small combined sets of exhausting plants driven by gas-engines. They have just supplied a set of two exhausters, combined with one engine, capable of passing 80,000 cubic feet of gas per hour, for the San Paulo Gas Company; and they have in hand exhausters for coke-oven works of a total capacity of 1½ million cubic feet per hour.

We have received from the Cowan branch of Messrs. Parkinson and W. & B. Cowan, Limited, their very neat and useful pocket-book and diary for 1906. The latter is arranged to present a week at each opening, with an additional space for memoranda; and following it are pages ruled for a cash account, &c. Preceding the diary are price lists of the firm's wet and dry meters, with their dimensions and a telegraphic code for ordering; and accompanying it is a coupon for £1000 of the Ocean Accident and Guarantee Corporation, Limited.

Last Saturday week the newly-formed Chemical Society of the Huddersfield Technical College paid their first visit to the gas-works. During their inspection, the party of about fifty were accompanied by the Engineer and Manager, Mr. E. A. Harman, who fully explained the chemical processes involved in the manufacture of gas. At the termination of the visit, a vote of thanks was accorded to Mr. Harman, on the motion of Mr. James Bruce, B.Sc. (the Lecturer in Chemistry at the Technical College), seconded by Mr. Robert Small (the Assistant Lecturer).

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WATER ENGINEER FOR SURVEYING IN SOUTH AMERICA. "B. B.," c/o Vickers, Nicholas Lane, E.C.
SLOT COLLECTOR. No. 4518.

Situations Wanted.

REPRESENTATIVE GAS FITTINGS AND APPARATUS. No. 1520.
REPRESENTATIVE GAS LIGHTING TRADE, &c. No. 4521.

Plant (Second-hand) Wanted.

TANK WAGGONS. No. 4515.

Plant (Second-hand) for Sale.

LAMPS AND CAGES. Sutton-in-Ashfield Gas Department.
MOUTHPIECES. Exeter Gas-Works.

Planing Machine for Retorts.

ADDRESS OF MAKER WANTED. No. 4517.

Use of Part of Retort-Bench Wanted. No. 4519.

Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY. Dec. 14.

TENDERS FOR

Elevating & Conveying Plant & Coal Breaker.

NEWPORT (MON.) GAS COMPANY. Tenders by Jan. 3.

Fire-Clay Goods.

BRADFORD GAS DEPARTMENT. Tenders by Dec. 21.
HALIFAX GAS DEPARTMENT. Tenders by Dec. 20.

Gas-Engine, &c.

NEWPORT (MON.) GAS COMPANY. Tenders by Jan. 3.

Gasholder.

WIDNES GAS DEPARTMENT. Tenders by Jan. 2.

General Stores, Ironmongery, Lead, Steel Goods, &c.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. Tenders by Dec. 27.
HALIFAX GAS DEPARTMENT. Tenders by Dec. 20.
SLOUGH GAS COMPANY. Tenders by Dec. 26.

Meters.

HALIFAX GAS DEPARTMENT. Tenders by Dec. 20.

Pipes and Specials.

EXMOUTH GAS COMPANY. Tenders by Dec. 22.
SLOUGH GAS COMPANY. Tenders by Dec. 26.

Purifiers, &c.

NEWPORT (MON.) GAS COMPANY. Tenders by Jan. 3.

Purifying Sheds.

NEWPORT (MON.) GAS COMPANY. Tenders by Jan. 3.

Retort-Bench (Regenerative).

NEWPORT (MON.) GAS COMPANY. Tenders by Jan. 3.

Retort-House Extension.

NEWPORT (MON.) GAS COMPANY. Tenders by Jan. 3.

Tar and Liquor.

ALDERSHOT GAS AND WATER COMPANY. Tenders by Dec. 29.
BRIDGEWATER COLLIERIES. Tenders by Dec. 27.
WORKSOP GAS COMPANY. Tenders by Dec. 28.

Valves and Connections.

HALIFAX GAS DEPARTMENT. Tenders by Dec. 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO, LTD., Chemical Manufacturers
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "ENAMEL." National Telephone 1759.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

AMMONIACAL Liquor wanted. BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

TRAVELLER, with Good Connection among Gas Companies in Fittings and Apparatus of all kinds, is open to represent an up-to-date and progressive House.
Address No. 4520, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a thoroughly Practical Gas Engineer of Twenty Years' Experience, a Situation either to REPRESENT a good Firm in the Gas Trade throughout the Kingdom, or as Lighting Inspector to a Railway Company, Corporation, or Local Body.
Address, No. 4521, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINEER, speaking Spanish, Experienced and Qualified to make detail Survey, Prepare Plans, Specifications, &c., for Gravitation Water Supply, and Distribution for South American City. About Four Months out and Home.
State Qualifications, Experience, and Terms required, to "B.B.," care of J. W. VICKERS, 5, NICHOLAS LANE, E.C.

WANTED, by a large Provincial Gas and Water Company, a smart young man of Good Address and Education as SLOT COLLECTOR, and to assist, when required, in Office. Good Constitution and steady habits. Wages 26s. per week, rising in Two Years to 30s.
Application, in own handwriting, with *Copies* of Three recent Testimonials, to No. 4518, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., before Dec. 13, 1905.

WANTED, New or Second-Hand Travelling TANKS-WAGONS for Gas Liquor, &c.
Address No. 4515, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED to Purchase, Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than Four Tons.
State Price to No. 4512, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED at a Gas-Works, the occasional USE of a Small Bench of Retorts, where there are more Retorts than always in use.
State distance from nearest Railway Station, and full Particulars, to No. 4519, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED to know, the Maker of Small Hand-Planing Machines for doing up Retort Mouthpieces in position.
Address No. 4517, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A quantity of 21-inch by 15-inch Second-Hand Oval MOUTHPIECES, Self-Sealing.
Apply, W. A. PADFIELD, Engineer, Gas Company, EXETER.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

M. LEVY ON INCANDESCENT GAS LIGHTING.
THE attention of Engineers, Contractors, Manufacturers, and others interested in the use of Gas for Lighting, Heating, and Motive Power, is called to the work on "INCANDESCENT GAS LIGHTING," by M. PAUL LEVY, C.E., of Paris, which was noticed in the "JOURNAL" on the 21st of November. It is a large volume of 284 pages, with 127 figures and 8 large plates.
Copies may be obtained at the Office of the "JOURNAL," at the Price of 8s. 6d. each, post free.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS from Founders and others to supply about 40 Tons of 4-inch and 14 Tons of 3-inch Socket and Spigot Cast-Iron MAIN PIPES.
Specification and Conditions may be had on application to the undersigned.
Tenders must be delivered not later than the first post on Friday, the 22nd inst., addressed to the Chairman of the Company, sealed, and endorsed "Tender for Pipes."
The Directors do not bind themselves to accept the lowest or any Tender.

By order,
JAMES T. FOSTER,
Secretary and Manager.

Exmouth, Dec. 9, 1905.

WIDNES CORPORATION GAS-WORKS.

TO GASHOLDER MAKERS.

THE Widnes Corporation invite Tenders for the Manufacture and Erection complete of a FOUR-LIFT GASHOLDER and external Steel Guide Framing, having a capacity of 900,000 cubic feet.
Copies of general Specification, Conditions, and Plans, to be had on application to Isaac Carr, M.Inst.C.E., Widnes, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Gasholder," must be delivered at the Town Hall, Widnes, on or before noon on Tuesday, the 2nd of January, 1906.

By order,
H. S. OPPENHEIM,
Town Clerk.

Widnes, Dec. 9, 1905.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the supply of—

1. IRONMONGERY.
2. STEEL GOODS.
3. FIRE-CLAY GOODS.
4. TARRED GASKIN, &c.
5. IRON VALVES and CONNECTIONS.
6. WET and DRY GAS METERS.

required during the ensuing Twelve Months.
Forms of Tender and further Particulars may be obtained on application to Mr. John Wilkinson, F.C.S., Engineer, Gas-Works, Halifax.
Tenders, endorsed "Gas-Works," together with the names of the articles tendered for, must be sent to the undersigned not later than Ten o'clock a.m. on Wednesday, the 20th of December, 1905.
The persons whose Tenders are accepted will be required to observe the Fair Contracts Clauses adopted by the Corporation.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

NEWPORT (MON.) GAS COMPANY.

THE Directors of the Newport (Mon.) Gas Company are prepared to receive TENDERS for the WORKS hereinafter described to be carried out at their Crindau Gas-Works, Newport, Mon.—viz:
Contract No. 1.—Extension of existing Retort-House, raising walls of Building, and Roof, Construction of Siding, and alteration of Existing Sidings.
Contract No. 2.—Construction of Regenerative Retort-Settings (Horizontal) of 216 Mouthpieces, with all Mains, Fittings, Stage Floor, Coal-handling plant, comprising Coal Breaker, Elevator, Conveyor, Hoppers, Waggon Tipping Travelling Crane, Capstans, and Motors.
Contract No. 3.—Coke-handling plant, comprising Telpher System, Coke Trams and Narrow Gauge Railway.
Contract No. 4.—Gas Engines and Plant for Generating and Distributing Power on Works.
Contract No. 5.—A Set of Six Purifiers with Valves, Connections, and Shed.
Drawings and Specifications may be seen on application to Mr. Thos. Canning, Assoc.M.Inst.C.E., the Engineer, Gas-Works, Mill Street, Newport (Mon.), on and after the 11th day of December, 1905, and Copies of the Specification, Schedule, and Form of Tender can be obtained on receipt, by the undersigned, of Five Guineas, which will be returned when a *bonâ-fide* Tender is received.
Tenders, addressed to the Chairman of the Company, to be lodged with the undersigned on or before Wednesday, the 3rd of January, 1906, Sealed and Endorsed as directed under the Specifications for each portion of the works.
The Directors do not bind themselves to accept the lowest or any Tender.

T. H. HAZELL,
Secretary.

Gas Offices, Mill Street,
Newport, Mon., Nov. 30, 1905.

ALDERSHOT GAS AND WATER COMPANY.

THE Directors are prepared to receive and consider TENDERS for the purchase of surplus TAR (approximately 1300 Tons) produced at their Gas-Works, Ash Road, Aldershot (private Siding into Works, Tongham Station, L. & S.W.R.), for a Year from Jan. 1 to Dec. 31, 1906.
Specification and Conditions can be obtained on application.
Tenders to be sent in to the undersigned, endorsed "Surplus Tar," to arrive not later than Nine a.m. on Friday, Dec. 29, 1905.
The highest or any Tender not necessarily accepted.

By order,
R. W. EDWARDS,
Secretary and General Manager.

THE Directors of the Worksop Gas Company invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st of January, 1906.
Tenders for Tar to state price per Ton delivered into Purchaser's Tanks at the Worksop Railway Station.
Tenders for Liquor to state price per Ton as tested by No. 1 Twaddel Hydrometer, delivered into boats near the Company's Works, or price per Ton delivered into Purchaser's Tanks at the Railway Station.
The Directors do not bind themselves to accept the highest or any Tender.
Tenders to be sent in by the 28th of December.
Worksop, Dec. 6, 1905.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS from Iron Founders, Gun Barrel Manufacturers, Timber Merchants, Druggists, Ropemakers, &c., for GOODS to be delivered on the Company's Works, Great Brunswick Street, in such quantities as may be required from time to time, up to the 31st of December, 1906.
Samples of Goods required are open to inspection on the Works, Great Brunswick Street, and printed lists of Articles required can be had on application to the Company's Office, D'Olier Street.
Tenders, endorsed "Tenders for Stores," to be lodged in my Office on or before the 27th inst.

FRANCIS T. COTTON,
Secretary and Manager.

Head Office: D'Olier Street,
Dublin, Dec. 8, 1905.

SLOUGH GAS AND COKE COMPANY.

GAS-MAINS.

TENDERS are invited for the supply of—
107 Tons 15 cwt. of 6-inch Socket and spigot (coated) CAST-IRON PIPES (with grooved sockets), each Pipe to weigh 2 tons 1 cwt. 21 qrs.
11 Tons 18 cwt. of 4-inch ditto, each Pipe to weigh 1 ton 1 cwt. 19 qrs.
8 Tons of 3-inch ditto, each Pipe to weigh 1 ton 0 cwt. 11 qrs.
Also for SPECIALS, LEAD, and YARN.
To be delivered at Langley Station (Great-Western Railway) within One Month from acceptance of Tender.
Any further Particulars may be obtained on application to the Manager of the Works.
Tenders, endorsed "Tender for Mains," to be delivered on or before Tuesday the 26th inst.

By order,
ARTHUR THOMAS,
Secretary.

Offices: 46A, High Street,
Slough, Dec. 7, 1905.

THE BOURNEMOUTH GAS AND WATER COMPANY.

ISSUE OF £10 SEVEN PER CENT. "B" SHARES. MINIMUM PRICE OF ISSUE, £15 PER SHARE.

Sale by Tender of 2000 £10 Seven per Cent "B" Shares in pursuance of the provisions of the Bournemouth Gas and Water Act, 1896.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL by TENDER 2000 "B" SHARES of £10 each (the Dividend on which is limited to £7 per cent.), to be paid up in full on or before the 14th of February, 1906.
The Company are now engaged in the erection of new Gas-Works at Poole, with all the latest Improvements, and the Capital now offered is required for this purpose, and also for extension of the Company's existing Works and Plant, to enable them to meet the increased demand for Gas and Water by reason of the continued development of the District supplied by the Company. The Dividend on the Original Shares for the half year ended the 30th of June, 1905, was at the rate of 10 per cent. per annum, with an addition at the rate of 4 per cent. per annum under the Sliding-Scale, and on the "B" Shares at the rate of 7 per cent. per annum. Since the 31st of December, 1888, to the 31st of December, 1903, the Dividend on the Original Shares has been at the rate of 13 per cent. per annum, and subsequently at the rate of 14 per cent.
The net profit earned in the year ended the 30th of June, 1905, after deducting all charges, including Debenture and other interest, amounted to £31,998 7s. 2d. During the same twelve months the sum of £2000 was added to Reserve Fund from Profits, and also £704 8s. 6d. from interest on Reserve Investments; and after payment of Dividends to the 30th of June, 1905, and writing off in respect of Poole Works on account of Works demolished £3000, and for re-sheeting gasholder £500, together £3500, the sum of £6350 4s. 10d. remained to be carried forward to the current half year.
Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth and Poole, or of the Secretary as under.
Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Thursday morning, the 14th of December, 1905.

By order,
WILLIAM CASH,
Secretary.

London: 90, Cannon Street, E.C.
Nov. 21, 1905.

TO RETORT MANUFACTURERS.

THE Bradford Corporation are prepared to receive TENDERS for the Supply of RETORTS, and of FIRE-BRICKS and FIRE-CLAY required in the fixing of such Retorts, during the Year 1906.

Form of Tender may be obtained on application to the Gas Engineer, Town Hall, Bradford.

Tenders, endorsed "Tender for Retorts," to be sent to me so as to arrive on or before Thursday, the 21st inst.

The Contract will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractor will be required to sign.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Dec. 8, 1905.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1906, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 27th of December.

Manchester, Nov. 28, 1905.

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OF THE

METROPOLITAN WATER COMPANIES

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AND OF THE

ACCOUNTS OF SOME OF THE PRINCIPAL
PROVINCIAL WATER UNDERTAKINGS
FOR THE YEAR 1904-1905.

Compiled by
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Chartered Accountants.

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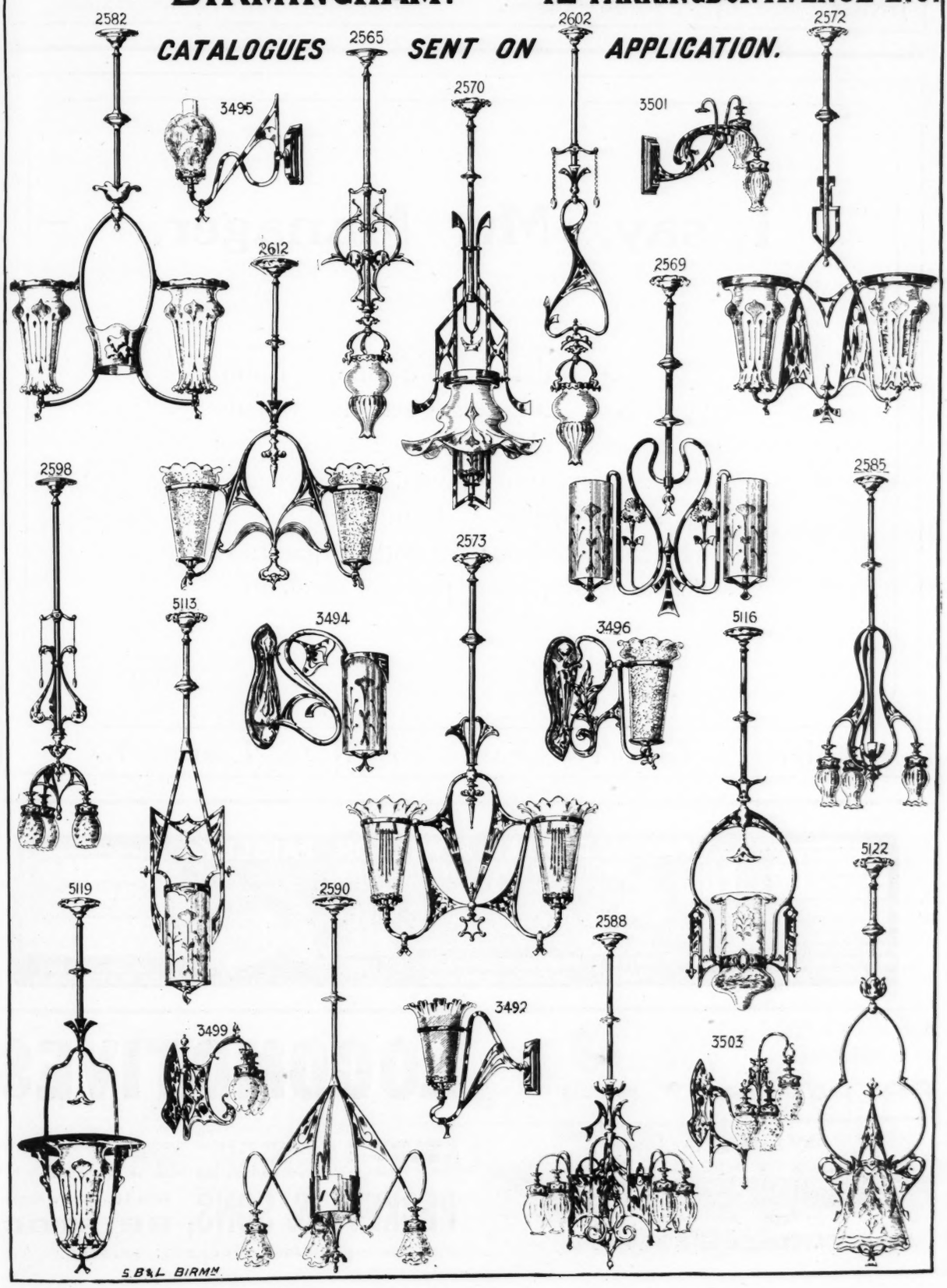

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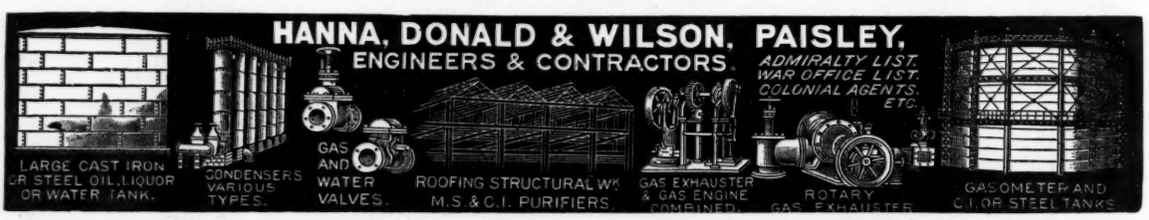
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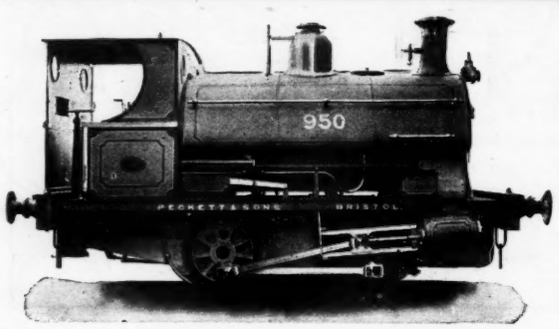

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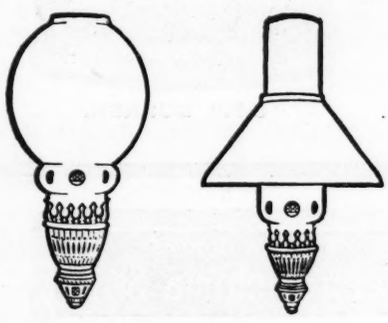

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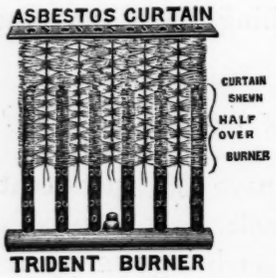

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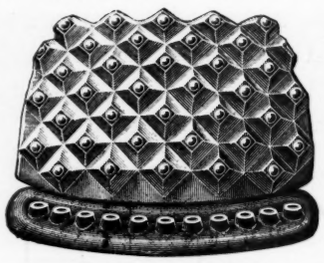
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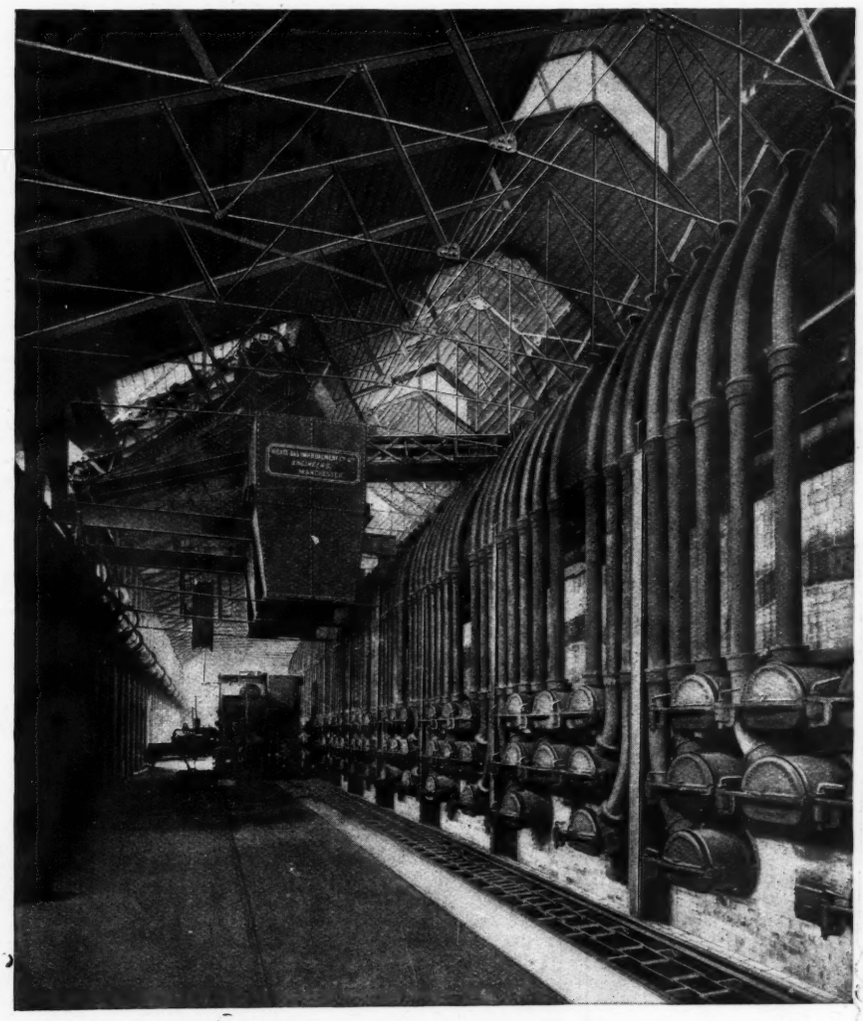

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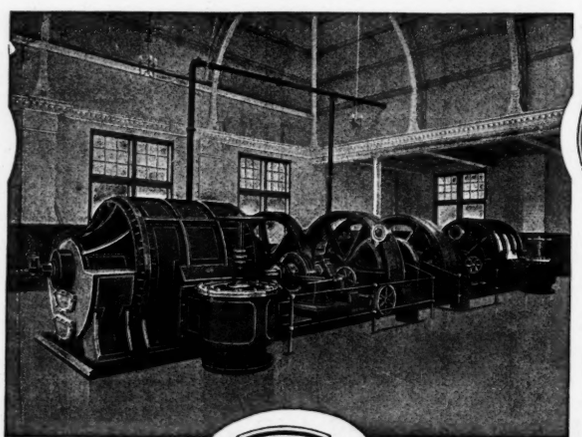

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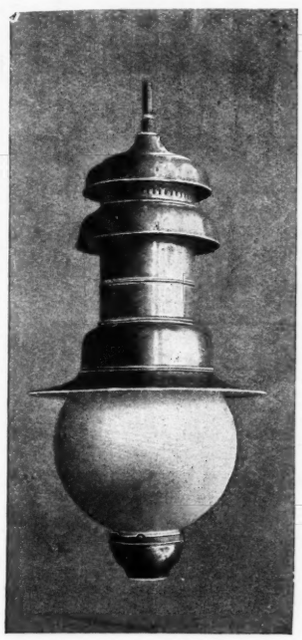

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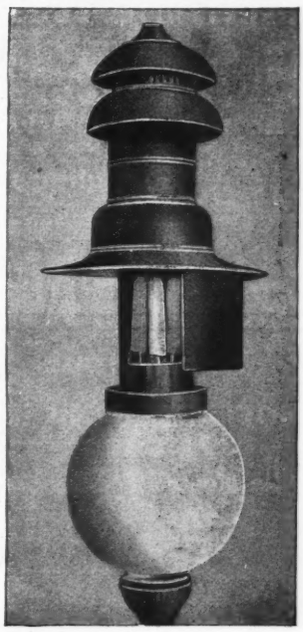

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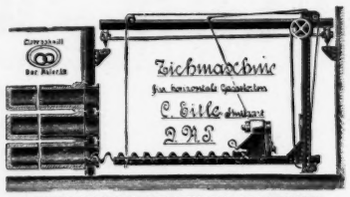

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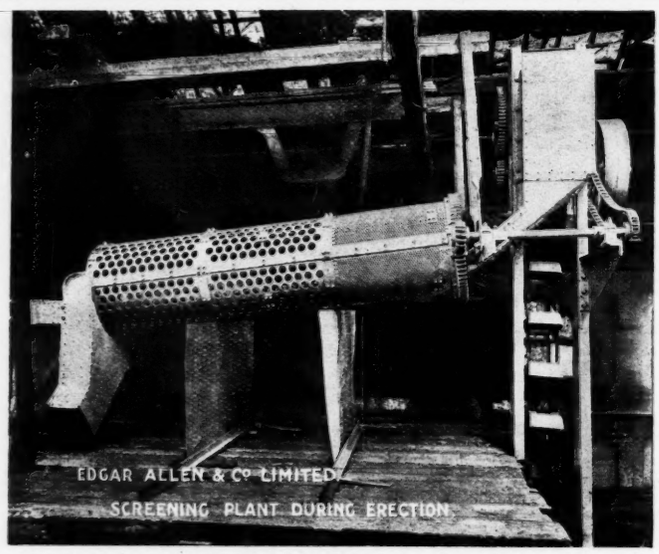

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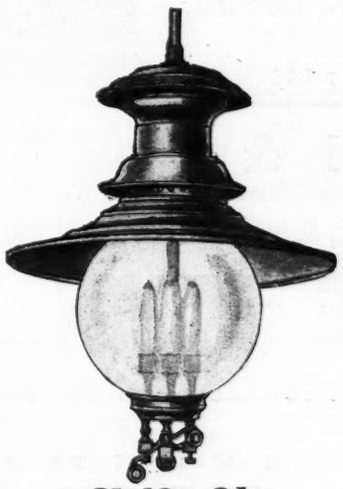

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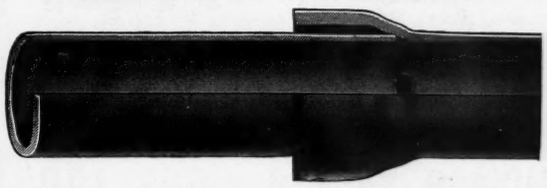

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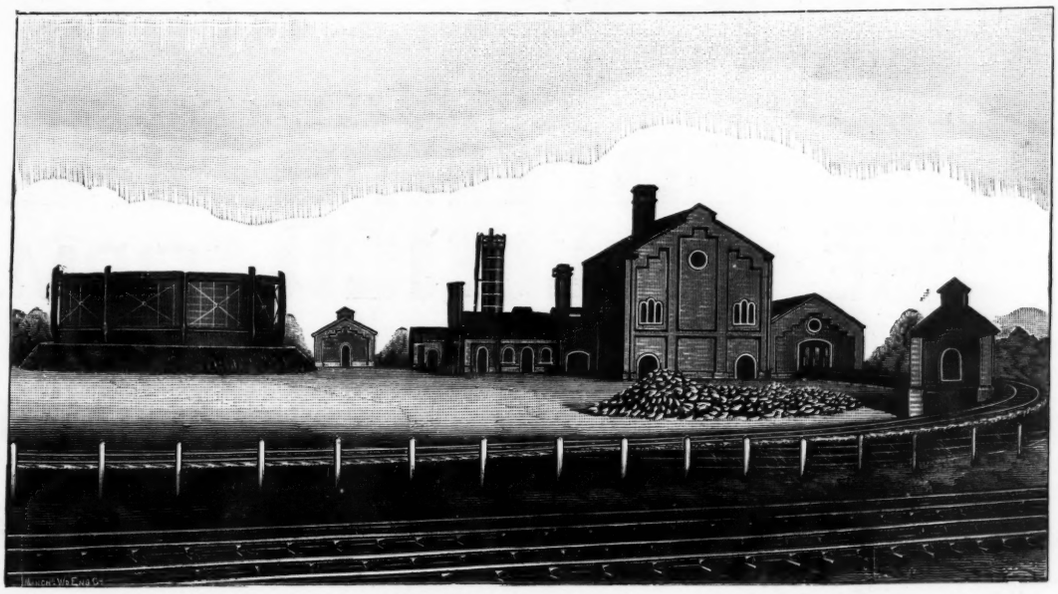

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